Plane Talk

SPRING · 1946

The New Stinson "Voyager 150"

Planning Our Nation's Security
By IRVING B. BABCOCK

How Planes Serve the Farmer
By HARRY WOODHEAD

Meet Convair's New 240
By I. M. LADDON

The Stinson Sales Plan
By WILLIAM A. BLEES

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SPRING, 1946 • **CONTENTS**

PUBLISHED BY CONSOLIDATED VULTEE AIRCRAFT CORPORATION

In this issue of Plane Talk some highly qualified men look at American aviation in its first postwar year, tell you about the significant progress they see, and report on some of the problems that are still unsolved.

As an industry, aircraft is relatively old, as such things go nowadays. But as a great force for world change, it is the newest thing this side of atomic energy.

Before the war, aviation made little difference in the lives of most Americans; and during the war years the chief effect of our great airplane production was designed for export. Now, for the first time, millions of Americans are going to find aviation becoming a part of their personal lives in peace time.

Fares have been reduced. Marvelous advances in design are speeding up flight schedules. Fleets of new planes which will give passengers comfort, convenience and safety of a degree never before approached are now on order, with deliveries to start soon. The number of passenger miles flown in the United States is already increasing by the millions annually. And millions of Americans who have never flown before are going to take to the air in the next decade.

That is the kind of future immediately ahead of us.

Consolidated Vultee — known familiarly as Convair—believes that its know-how contributed greatly to building the American air power that helped to win the war. Convair expects to be making just as great a contribution to the progress of American aviation in the exciting years ahead.

In the pages following, the chief officers of the Corporation speak to Plane Talk readers personally, about some of the postwar phases of aircraft production that are of significance to all Americans.

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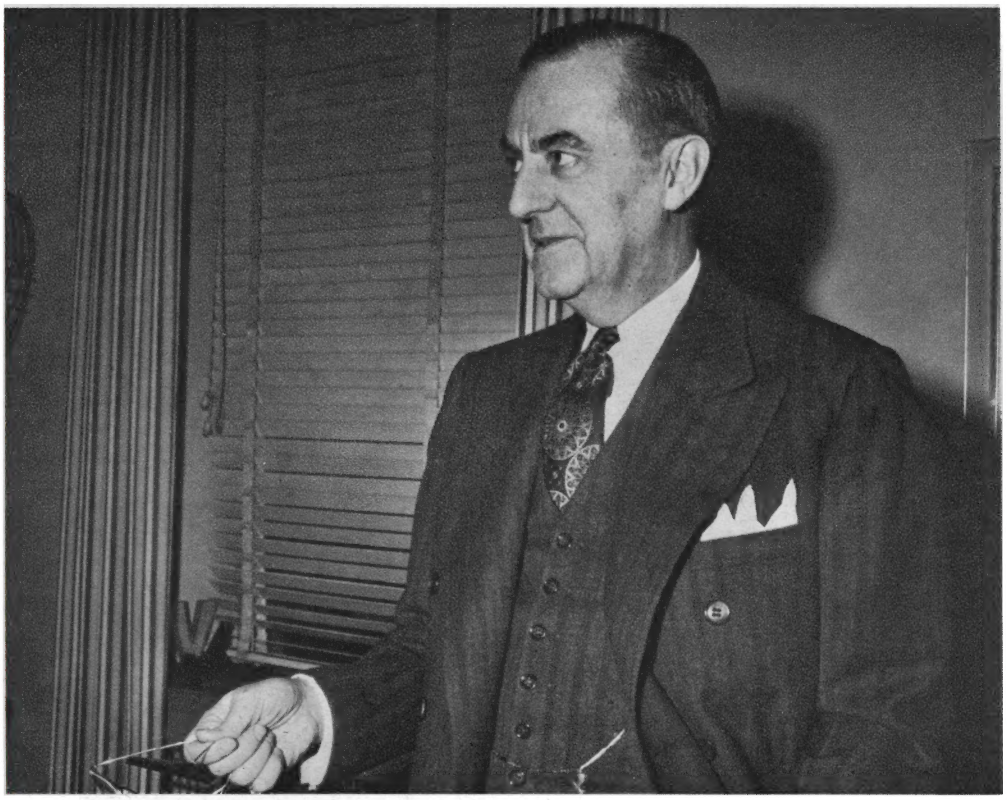
Planning Our Nation's Security

By Irving B. Babcock



Mr. Babcock is Chairman of the Board of Consolidated Vultee Aircraft Corporation

FOR a few months after the fall of the atomic bomb, various pessimists were declaring that the idea of airpower was obsolescent.

They pictured future wars that would be won in a few hours by rocket guns hurling atomic missiles thousands of miles across the earth.

Mothers wrote letters to newspapers asking why we need military training or air forces, when some dictator of the future could destroy a rival nation in its sleep by pressing a button.

Fortunately, a common sense study appeared late in 1945 that restored balance to this picture. It was the report of a group of experts appointed by the Air Coordinating Committee to make careful estimates of America's airpower requirements in the near future, and to set down a concrete program..

These experts, whose report was promptly approved by the Committee in entirety, and presented as a program to the Senate Military Affairs Committee, declared:

"At the present time, the atomic bomb is considered an adjunct to airpower rather than a substitute for it. This conception includes all of the developments which are taking place in new methods of propulsion, in the use of electronic devices, and in the attainment of supersonic speeds. We have endeavored, therefore, in our detailed planning to project ourselves into the foreseeable future rather than into the realm of little known or untested developments."

In other words, this study has concentrated on the problem of what we should be doing right now, on the basis of present realities. It has found that we should be building a minimum of 3,000 new military planes a year in peace time, and perhaps as many as 5,780 annually. The cost would range from $750 millions to $1,400 millions. It estimates an average useful life of such military planes at 5½ years.

In reaching its minimum estimate, the Committee's experts declare that this will suffice *"only after maintenance of world peace is well secured, and a substantial degree of disarmament has taken place."* And the study goes on:

"We are deeply concerned because prospective production over the next twelve months will be appreciably below this lower level. . . . Scheduled military production for the calendar year 1946 is less than 2,000 airplanes—not even 4 per cent of the July 1945 production rate. This reduced level of procurement is eroding the base for any future expansion."

The concern of the Air Coordinating Committee over America's slump into unpreparedness, before peace becomes secure, reflects the thought of some of our highest authorities. General of the Army George C. Marshall, then Chief of Staff, said in the same week when this airpower report was issued:

"For the moment, in a wide-spread crisis of the American people, demobilization has become, in effect, disintegration—not only of the armed forces, but apparently of all conception of world responsibility and what it demands of us....

"If we are to nourish the infant United Nations organization, and thus establish some possibility of a future decent world order, definite measures must be taken immediately to determine at least the basic principles for our post-war military policy. ... The military establishment cannot hope to insure the safety of the United States very much longer at the present rate of demobilization. . . ."

This disintegration that General Marshall saw in action could be nowhere more costly to the nation than in the aircraft industry. For the real basis of American airpower has been brains, not planes. The planes grow obsolescent rapidly. If they are not then discarded, and replaced by better ones, a nation's airpower vanishes. The know-how of scientists and engineers and craftsmen, always busy exploring new problems and conquering them, has been the real foundation of America's progress.

If great numbers of these workers in the aircraft industry are now to be permanently dispersed and scattered to the winds, the loss cannot be made up in any foreseeable future. "Know-how" is a perishable.

The Air Coordinating Committee's study concludes that the aircraft industry will henceforth be building between 325 and 475 commercial transports annually. It also foresees a possible market in the near-term future for between 20,000 and 45,000 personal aircraft each year.

Now if the maximum estimates of this Committee are effected in production both of military and civilian aircraft, our future aircraft production will still be under 10 per cent of our aircraft production in 1944, in terms of aircraft weight. If only the minimum estimates are effected, our future aircraft production will be just 5 per cent of the 1944 output.

It is clear, therefore, that the Committee's figures, which have been submitted to Congress as a recommendation for national action, provide at best for a very modest aircraft industry in peace time.

PRIOR to World War II, in 1936 and 1937, approximately 60 per cent of the industry's output went to the armed forces. A somewhat similar ratio should be maintained in the future, if the industry is to be kept in healthy operation.

It is not for the aircraft manufacturers to estimate the number of planes our air forces will require for their job of guarding the nation's security. It does rest upon the industry to estimate the volume of Government orders it will need, in order to keep its human resources and plant facilities in readiness for national emergency. A peace time production amounting to 10 per cent of the 1944 aircraft output is, by this standard, a modest proposal.

Leaders who try to plan for future national security inevitably run into the question, "But what emergency are we planning against? Who do you think will threaten us?"

We certainly face danger from no known enemies. It is the unknown we must take into calculation — and this is the danger most difficult to prepare for.

That is why our leaders urge us never to neglect any possible defenses again. As the Air Coordinating Committee has said: "Our conception of national defense should be based upon the premise that this country will be the first target of attack and that we will not have any major allies for at least the early period of a future war."

No one at this time can possibly forecast exactly what sort of airpower we shall need if some mad aggressor provoked World War III. The planes with which we ended World War II—planes which for the first time in history forced a nation's surrender while its main armies were intact — were already obsolete.

We already had in 1945 the know-how to build far more amazing instruments of airpower than those we used in the war. But these new instruments, once built, will still be only stepping stones in development.

Hence our airpower program in peace time will always be a problem in maintaining dynamic progress. Research must be constant and continuous. Further, it would hamstring this research hopelessly if it were confined to institutions of the Army and Navy. Every manufacturer should compete in it, and be enabled to devote relatively large sums to it.

The research and development should not stop with paper work, nor even with experimental versions of airpower weapons. These experimental versions must be completely engineered, tested, used in training, and made ready for large scale production on extremely short notice by placement of moderate production orders. Reserve capacity in aircraft and airframe plants must be in hand to permit expanded production the moment emergency comes. Machine tools should be ready, and detailed tooling developed from the moderate production orders.

That is why Congress has been urged to provide for maintaining in reserve sixteen large airframe and engine plants, and a total of some 63,000 machines needed in production. The human organizations in the aircraft industry must similarly be kept in high gear, prepared for expansion in emergency.

We have every reason to regret that the world is so organized — or unorganized — that we must think of national security in such terms. But we cannot cure the world situation by blinding ourselves to its realities.

The Air Coordinating Committee has done an important service in setting down an initial program, in concrete proposals, for the nation to act on in this interim period between the war that was, and the new world organization that is to come.

I. M. Laddon of Consolidated Vultee said recently, "The challenge of the unknown in designing and building aircraft was never greater than today." We are at the threshold of tremendous developments. Consolidated Vultee, for instance, already is designing aircraft the like of which the world has not yet seen. Its great XC-99 is a mechanism that could be adopted even to the transport of all our land armies, if that need arises in the future. General Marshall has already hinted at such a development; the day when we must give our infantry wings may be nearer than many think. The General said in his biennial report of 1945:

"If this nation is ever again at war, suffering as Britain did in this war, the disastrous attacks of rocket-propelled weapons with explosive power like our own atomic bomb, it will bleed and suffer perhaps to the point of annihilation, unless we can move armies of men into the enemy bases of operations and seize the sites from which he launches his attacks."

Such an undertaking could only be accomplished by air transport on a scale never yet achieved. The United States is the one nation in the world with an aircraft industry great enough to make this kind of defense within practical reach. Every American citizen has a stake in this industry's task of maintaining American leadership in such developments.

Admittedly, the status of many new weapons, now just envisioned or in initial development, is still to be clarified. But as the Air Coordinating Committee tells us, "if we are perpetually waiting for new developments to mature, we shall end up by being unprepared to produce anything."

We must start somewhere, and as soon as we can. There is every reason to hope that the American people will act promptly through their Representatives and Senators, to make the appropriations for the airpower program which the Air Coordinating Committee has presented.

This Committee is an authority whose conclusions warrant the respect of every citizen. It was created in March of 1945 by the Secretaries of State, War, Navy, and Commerce, through an interdepartmental memorandum. Its members consist of the Assistant Secretaries of State, War, Navy, and Commerce, together with the Chairman of the Civil Aeronautics Board. The Administrator of Civil Aeronautics is its Executive Secretary. No officer of any aircraft corporation is a member.

Its functions are not to administer, but to recommend policy. The hoped for result will be wisely integrated action between the various agencies of the Federal Government that are charged with responsibilities in the field of aviation.

On such coordinated action depends a large part of the aircraft industry's future. The war we have won can readily prove a Pyrrhic victory, unless wise policy guides us in establishing and maintaining peace.

By Harry Woodhead, President
Consolidated Vultee Aircraft Corporation

WHAT HAS HAPPENED TO THE AVIATION INDUSTRY?

When the war ended last year, Consolidated Vultee had 13 plants in operation, scattered from San Diego east to Allentown, and some 85,000 skilled employees at work. We had produced over 30,000 planes during the war period, ranging from the great Dominator and Liberator to the little L-5.

We had been given to understand in the aviation industry—as the war went on, and we were going through our enforced expansion—that when our Air Forces achieved victory we would have no sudden terminations of military orders.

Yet within 24 hours after the war with Japan was ended, the telegraph offices of the country were jammed with cancellation messages enroute to manufacturers.

Consolidated Vultee got its share of those messages. Out went 20,000—30,000 Consolidated Vultee workers. Another whistle, and we had to let another 30,000 go. And so on. Four months after the ending of the war, we had just 14,000 workers left.

All this was not the fault of the Air Forces. They depend entirely upon the Congress, representing the nation, for the appropriations that sustain them.

What happened to us at Consolidated Vultee illustrates in general what has happened to the nation's whole aircraft industry. No other American industry suffered such a terrific shrinkage when the war ended.

The aviation industry's profits on its tremendous production during the war were very small—in 1944 they were only 1.2 percent on sales. Although total volume of war business enabled the industry to come through the war in a sound financial position, we need orders to keep our organizations together. Our industry has been faced with the dispersal of most of its skilled workers.

If this process goes on any further, our people are going to face a serious threat to their nation's security. Not only will we have no air power; we shall have lost the capacity to create air power.

There has been a lot of loose talk about the atomic bomb, with strong hints that it eliminates the need for an army or an Air Force hereafter. That's idle conversation. Today we are still at the beginning of airplane design. Similarly, we are a long way off from the day when a few push buttons will send atomic bombs soaring through the stratosphere.

That era may come. But meanwhile, what?

Mr. Babcock, the Chairman of the Board of Consolidated Vultee, reports to you the answer of experts in the adjoining columns.

These experts, none of whom are connected with the aircraft industry, make it clear why we are going to need a strong Air Force indefinitely. The first atomic bombs were dropped by plane; the only practical way of using them today is still by plane; and air power is still by all odds the most important part of any defense or offense.

We also need a strong aircraft industry, in being, to back up our Air Force with the best equipment in the world. To keep a nucleus of big plants ready for prompt action in any national emergency, we shall need a flow of military orders. Production of planes for civilian use cannot sustain us.

Before the war the airlines in this country used about 350 planes, all told. Maybe in the next few years they can expand enough to use 3,000 planes. That seems a huge expansion. But even that would probably mean orders for not more than 500 planes a year.

Our people are also going to be using personal planes in increasing numbers. But suppose we do manage to sell 20 or 30 thousand of these a year, or even 50 thousand? All fifty thousand airplanes wouldn't be equivalent to the work of developing and building 100 modern bombers, so far as national safety is concerned.

There's altogether too much talk about our keeping up research and development, and not enough about continuing military production on a scale to keep our facilities and a skilled nucleus of workers in constant readiness to serve the nation.

Preparedness in the aircraft industry will seem economic waste *only* if the nation does not need the production. If we ever do need it, then it turns out to be the best investment we ever made.

Unless adequate post-war appropriations are granted by Congress, to enable the Services to maintain our Air Superiority, this country is going to be more vulnerable than ever before in its history. For oceans are no longer a barrier to protect us.

MEET CONVAIR'S NEW 240

By I. M. LADDON

Executive Vice President
Consolidated Vultee Aircraft Corporation

TODAY'S airline operations show a steady increase in passengers and cargo carried, but the airlines have had to carry this increasing load with obsolescent equipment designed before the war. In a few months the whole picture is going to be different. New plans are on the way. And you're going to get a seat whenever you want it.

The announcement of the Convair-240, which is one of the new planes American Airlines and Western Air Lines have on order, heralds a wholly new kind of travel for postwar air passengers.

The public has been used to flying at 160 to 180 miles per hour. This new 40-passenger, twin engine continental transport is going to fly people at 300 miles per hour, in new luxury.

The Convair-240 is the product of a joint engineering effort. Designed into it by aircraft and airline engineers, working together, are excellent safety characteristics, high cruising speed, great economy of operation and vastly increased passenger comfort and convenience. It combines advanced aerodynamic developments with operating improvements that the airlines have determined will increase the pleasure and convenience of airline travelers.

We believe the 40-passenger Convair-240 will be among the first airliners whose low operational costs will bring further decreases in fares within sight.

Airline operation of the first Convair-240 airliners will begin early in 1947. The first test flight of the prototype airplane is scheduled for autumn this year.

American's order for 100 of these airplanes is a measure of its estimate of the coming expansion in air travel. For these 100 airplanes constitute an airline fleet of 4,000 passenger seats.

This amounts to almost two-thirds of the total passenger seating capacity of the combined fleets of all domestic airlines in 1941. Due to their higher cruising speed, this fleet of 100 airplanes will fly as many passenger miles per year as the combined fleets of all the domestic airlines in 1941.

Similarly, the order by Western Air Lines for 20 Convair-240 airliners means that Western will be able to fly 15,000 passengers daily, instead of the present 2,000. By approximately doubling the number of planes in its fleet, Western will multiply its carrying capacity by 7½.

These airplanes embody the first commercial application of what we call "jet exhaust augmentation". The exhaust from the engine, which is of conventional aircraft design, is used to provide an appreciable amount of jet propulsion for increasing the thrust horsepower, and consequently the speed of the airplane.

In carrying five tons of passengers at 300 miles per hour, the Convair-240 flies over 100 miles an hour faster than pre-war planes, and makes them seem almost archaic.

We look on this plane as a new kind of workhorse in the aviation industry — one that does almost any kind of indicated job better and cheaper than it was done before.

The development of the Convair-240 began over a year ago, when Consolidated Vultee engineers sat down with airline engineers to plan for a modern transport that would supersede present twin engine planes in speed, comfort and operating economy.

Around the basic design problem of carrying 40 passengers with a quantity of express cargo, at cruising speeds of 300 miles per hour, Convair engineers considered many design possibilities. Both high wing and low wing designs were studied. The high wing was discarded in view of the airlines' faith in the superior safety of the low wing design.

While airlines do not plan on having crashes, they prefer planes which have been designed to provide the maximum amount of passenger protection in emergencies. Rather than have the heavy structure of a wing center section located over the heads of the passengers, the low wing brings it beneath the passenger compartment where it is a protection to absorb shock and ground friction in an emergency landing.

But to use a low wing, and still obtain the advantages of high wing design, was an engineering challenge.

The tricycle landing gear contributes to the fuselage accessibility by bringing the nose down to the level of the center of the airplane; it provides a level floor on the ground as well as in flight.

The self-contained entrance stairway, which unfolds out of the side of the airplane, improves accessibility for passengers. The moment the airplane has taxied into position at its destination, the pilot or the stewardess will lower the stairway to permit immediate passenger unloading. This eliminates the usual delay of passengers standing in the aisle to wait for the unloading platform to be rolled up to the door.

MANY of the airlines are now considering innovations that add to passenger convenience, while reducing the indirect costs and making lower fares possible to a larger market.

One of these is a new method of luggage handling. Almost every air traveler has experienced the annoyance that comes with making a hundred mile trip in half an hour or so only to wait another quarter hour for his bags while the luggage wagon was trundled around to the front of the station. This is especially annoying for business men, who usually travel with light luggage. It would be a pleasure to be able to get up, take your bag, and walk out of the airplane ready to go.

That kind of personal luggage handling by the passenger has been put to practical test by some of the airlines, and heartily endorsed by the traveling public. Passengers on the Convair-240 will be able to carry their own luggage up the stairway, deposit it in luggage racks at the head of the stairs and step into the cabin to their seats.

The new self-contained entrance stairway, which in itself is a novel convenience, offers another new advantage in its location in the side of the fuselage, forward of the wing and propellers. This location is related to another new feature on commercial transports—reversible pitch propellers.

The layman should know that reversible pitch propellers are just what their name implies—propellers that can be reversed in pitch, and used as brakes to slow down a plane in landing.

They produce a reverse thrust when a plane's wheels touch the ground, and so provide extra braking force for use in an emergency when an extra fast stop is desired, or when normal wheel braking is ineffective due to mechanical failure or icy runways. This is an important safety feature. The use of reverse propellers in landing may be adopted as a routine procedure to reduce wear on tires and brakes.

The design efficiency of reverse pitch propellers was proved by tests on a B-32 bomber at our Fort Worth plant. The tests showed that by combining reverse-thrust propeller-braking with only 50 per cent of normal wheel braking, the resulting landing run was less than one-half of the landing run required with full wheel braking alone.

But improved braking is only one of the advantages of reversible pitch propellers. They also facilitate ground maneuvering, by enabling the airplane to be taxied either forward or backward.

Here is where the reversible pitch propellers and the entrance forward of the wing offer additional advantages in the design of the Convair-240.

Airline engineers hit upon the idea of using these two features to provide an airplane that could be taxied head-on to the parking ramp for loading and servicing, and then backed directly away from the ramp to the taxi strip.

Loading time will be cut markedly by this procedure. Further, since the airplanes of this design will not need to taxi in and then swing around sideways as planes do today, considerably less airport ramp space will be needed. Tomorrow's airports will be equipped so that airplanes like the Convair-240 can taxi in under a canopy, and then back out again after unloading and loading, without ever exposing passengers to inclement weather.

The throttle arrangement which incorporates the control for reversing the thrust of the propellers is worth describing. The familiar motion of pilots when they retard forward speed is to move the throttle levers backward. In the Convair-240, pulling the throttle levers back beyond the normal close position automatically reverses the pitch of the propellers, and then re-opens the throttles as the levers are pulled still farther back, thus providing increased power for the reversed-thrust braking of the airplane, or for taxiing backward.

There are suitable safety stops in the system so that the propellers cannot be reversed until the airplane is on the ground, and so that the throttles cannot open as the propeller blades are passing through zero pitch. This is another example of wartime engineering progress which will benefit post-war commercial planes and contribute to superiority over present day designs.

In the structural design of the Convair-240, we have made use of the latest high-strength aluminum alloys and aluminum alloy heat treat processes which Convair actively developed during the war. Our wartime experience in using new aluminum and magnesium alloys, gained particularly while developing our B-32 bomber and our new giant B-36 bomber, are now paying peacetime dividends. More payload for less airplane weight is now possible, offering new economies in operation, which in turn mean lower fares for tomorrow's air travelers.

The Convair-240 is powered with the war tested Pratt & Whitney R2800 engine, which develops 2300 horsepower for take-off. To those familiar with the economics of aircraft design and operation, it might seem unreasonable to use such large engines on a twin-engine, medium range transport. To some, it might appear that a smaller engine with its lower fuel and oil consumption, and lower maintenance and depreciation, would provide an airplane with a lower direct flying cost.

Actually, however, this is not the case. Although fuel, maintenance and depreciation costs are lower with the smaller engine, other counteracting factors are at work.

The airplane, having less power, will carry fewer pounds of payload. It will cover fewer miles in a given time. In an hour's flying time, it will accomplish fewer ton-miles of work, although still costing approximately the same for crew and maintenance. Such adverse effects upon the direct operating cost will more than cancel out the benefits of reduced fuel, maintenance and depreciation costs of the engine.

From the power plants available for use in the Convair-240 design, we selected one of proved dependability, of the size that will give the best combination of speed and load-carrying ability for a medium range transport.

The result is that the Convair-240, with a gross weight of 36,000 pounds, will carry a payload of 9,500 pounds for a distance of 500 miles. It will cruise at 300 miles an hour at 10,000 feet altitude; and, if ever necessary, it will fly at 340 miles an hour.

The jet exhaust feature is combined with the design of the engine cooling system in a way that eliminates a complicated cowl flap installation. The result is a smooth, one piece cowl. The tail pipes from the exhaust collector ring, instead of exhausting immediately into the outside air in the conventional manner, are led aft over the wing section within a cooling air shroud. The jet action of the exhaust gases, as they emerge from the tail pipes within the shroud, forces the air through the shroud at a very high speed, and causes the air to be sucked in from the front around the engine cylinders at a correspondingly high speed. This provides excellent engine cooling.

This method of combining the engine exhaust and engine cooling systems is known as an aspirated exhaust system. It has a further advantage of facilitating the thermal anti-icing of the wing and empennage leading edges.

Thermal anti-icing is another of Convair's wartime developments which is given commercial application on the Convair-240. It was first installed on the Catalina in 1938. In the earlier wartime design, the hot air for anti-icing was obtained by passing cool air through a heat exchanger which was heated by the exhaust gases.

On the Convair-240, when anti-icing is required, a valve in the aspirated exhaust system is opened, and a mixture of exhaust gases and engine cooling air is conducted directly to the leading edges of the wing and empennage. This same mixture of exhaust gases and cooling air is also conducted to a heat exchanger—similar to the one first installed on the famous Catalina—which is used to provide fresh warmed air in the cabin for the passengers and crew.

Fresh air, after going through this heat exchanger, enters ducts which line the side walls of the cabin. The warm air is distributed so evenly, and is expelled into the cabin from the ceiling at such a low velocity, that it creates a uniformly heated cabin with no drafts.

This method of warming the walls of the cabin with heated air, instead of attempting to warm the passengers by blowing hot air on them, is known as the radiant

The luxurious interior of the Convair-240 has been designed in consultation with Henry Dreyfuss.

wall heating system. It is one of the latest developments in heating and ventilating engineering.

Many other features of the Convair-240 can be cited to show similar examples of advanced engineering. Control surfaces, for instance, are equipped with two sets of trailing edge tabs. One is the conventional set of tabs used for trimming the airplane. The other is a servo-tab linkage so designed that, as the pilot moves the control surface to maneuver the airplane, its tab is automatically deflected in the proper direction to assist him.

This design has the effect of side-stepping the law which says that control forces must increase in direct ratio to the square of the speed. By adjusting the servo-tab linkage we will be able to provide the pilots of the Convair-240 with exactly the degree of "feel" to the controls that they desire.

The tricycle landing gear is equipped with dual wheels on the nose gear as well as on the main gear, so that a blowout can never be serious on take-off or landing. The dual wheels on the nose gear are co-rotating wheels. That is, the wheels do not rotate individually; they are pinned to a common shaft so that the two wheels and the shaft all rotate as a unit.

This design has such inherent stability that no shimmy damper is required. Since neither wheel can rotate faster than the other, there is no tendency for the nose gear to veer off course even under the extreme condition of a tire failure.

This landing gear design, added to the maneuverability afforded by the reversible thrust propellers, and the fact that the nose is steerable from the pilot's cockpit, makes the Convair-240 an airplane completely at home on the ground, as well as in the air.

During the past year the pilot's cockpit in the mock-up of our Model 110 has been reviewed by the pilots and engineers of nearly every major airline in the country, including a committee from the Airline Pilot's Association. The cockpit of the Convair-240 incorporates the constructive criticism that resulted. The controls have been made more accessible. Improved pilot vision has been made the guiding design factor. The pilots have been moved up close to the windshield to provide them with angles of vision considerably greater than are found on present-day airliners.

The plane's entire design has similarly been submitted to the critiques of experts. As airline executives, engineers and passenger service personnel reviewed the passenger cabin mock-up, our engineers listened and took notes. Windows of generous size have been provided. Passenger seats have been designed to be fully reclinable. The back of each seat is made concave, to give each passenger room to stretch out his legs full length beneath the seat in front.

In designing such details, as well as the more important features like the low wing and the self-contained entrance stairway, the one object has been the comfort, safety and convenience of both passengers and crew.

It seems useful here to dispel one prevalent notion regarding the advent of new commercial transport designs. Some feel that aircraft manufacturers, in developing postwar markets for commercial aircraft, face a serious competitive handicap in the fact that large quantities of war-surplus commercial-type aircraft are available for purchase.

This is not true. Quite the contrary is the case. The only reason in the world why anybody would buy a war-surplus commercial-type airplane, which is necessarily of obsolete design, is because it is available and an airline can start earning money with it right now.

If offered equal availability between war-surplus aircraft and the new, faster, more efficient designs representing our aeronautical progress during the war period, no airplane operator could afford to purchase war-surplus aircraft—not even at a fraction of the cost of new aircraft. It would take the new aircraft only a few months of operation to repay its higher initial cost.

As previously noted, *a fleet of only 100 Convair-240's has the same four billion passenger-miles per year capacity which was the 1941 total of all the airplanes on all our domestic* airlines.

In other words, these 100 airplanes can handle as much air travel as was carried by the entire 359 airplanes which all the airlines operated in 1941.

This comparison alone makes it obvious, without reference to operating costs, that no airline management will operate aircraft of pre-war design any longer than absolutely necessary.

This will remain true in the future. Airplanes designed today will be obsolete within three to five years. The progress of aeronautical science is moving with incredible speed. It is doubtful that any man can envisage developments a decade from today.

HOW PLANES SERVE THE FARMER

Farmers are finding the airplane useful for crop-dusting, seeding, fire control, cattle round-ups, and many odd chores, as well as for transport.

By HARRY WOODHEAD

President, Consolidated Vultee Aircraft Corporation

THE American farmer, in his usual alert way, has been among the first to realize how useful the airplane can be in all sorts of daily chores.

Proof of this exists in the organization called the Flying Farmers, which started in Oklahoma only two years ago, and is now expanding rapidly. We haven't heard yet of any organization of Flying Doctors, or Flying Bankers or Flying Plumbers, using the airplane in their everyday business.

It is probably natural that the Flying Farmers idea originated in the southwest—where distances are vast. The Flying Farmers in Oklahoma use planes for supervising cattle round-ups, hunting for strays, chasing coyotes — which they actually shoot from low flying planes—and for such odd chores as looking for fence-breaks. Then, of course, a plane is wonderful for making a fast trip into town to pick up a spare part for the tractor, without waste of time, or for just going visiting.

One leader in the Oklahoma group, a remarkable chap named Heinie Bomhoff, has taught 200 of his neighbors to be pilots; and the organization has grown so fast that over 200 Oklahoma farmers and their wives attended its second annual convention last August in Stillwater, where Oklahoma's A. and M. College is located.

Farmers are beginning to discover all the ways a small plane can be useful in farm operations. The Civil Aeronautics Administration reports great success, for instance, in using the airplane for seeding a large variety of crops. The crops include all kinds of range grasses, as well as wheat, oats, alfalfa, and rice. The story of how success was obtained in sowing rice from the air is typical.

In early experiments in aerial planting, dry rice was sown on fields already flooded. But the rice seed floated and drifted on the water, and finally sank in unsatisfactory bunches—too much here, too little there. Then experiments were made in soaking the seed—almost to the point of germination—before sowing from the plane. This works perfectly. The soaked seed sinks quickly without drifting. An even sowing results. Equally important, the birds do not have a holiday feast.

Today more than 80 percent of California's rice lands—some 130,000 acres—are being "farmed" from the air. Planes are used even after the crop comes up to scare off ducks and geese that might feed on the young plants—a kind of flying scarecrow.

Seeding of grasses over thousands of acres of grazing land is reported to be similarly successful. Once, when land was grazed to depletion or burned over, it was considered almost lost—especially in rugged regions where use of ground machinery was impractical. Today the aerial seeder can sow vast areas with grass seed in a few hours, completing the operation before a scheduled or forecasted rain.

One of the most important farming uses of the plane we've heard about in recent years has been in the protection of crops from pests. In this job, the speed of the plane is of all-out importance. When a pest appears, the loss of a few days in its control can mean disaster. But an airplane, covering 300 to 500 acres a day with one of the modern insecticides, can destroy the menace almost overnight.

One of the earliest uses of the airplane for pest control was in the cotton lands of the south, where the boll weevil has created economic headaches for generations. Today airplanes are helping control insect pests in citrus groves, in fruit orchards, in truck farm areas. For some truck farmers, aerial spraying of dust seems to prove more effective than any other method of applying it, since the plane propeller gives a whirling motion to the poisonous dust so that it reaches down to the under side of the plant leaves, where most of the insects feed.

One of our important crops is timber,

The farmer needs an all-round plane. The 4-place Stinson "Voyager 150" is licensed by the CAA both for cross country flying and flight training.

and one of its greatest hazards is fire. In the past, it could take several days for a fire crew to work through dense forest lands after a fire was discovered. By then the blaze could be wholly out of control. Today we hear of fire fighters being parachuted into the area immediately. We are probably nearing the time when firefighting chemicals can be sprayed directly from an airplane.

There is another special use for planes in rural life on which one cannot put a dollar value—the mission of rescue. Dreadful accidents can happen on the farm, just as in all industry where machines are used daily. Unfortunately, many rural communities do not yet have adequate hospital facilities.

Here the airplane can offer in peace the service that the L-5 "Flying Jeep" rendered in war.

These Stinson-built planes were good for every conceivable kind of liaison work —scouting enemy positions, acting as eyes for our own artillery and tank corps, carrying documents to headquarters, surveying telephone lines to locate broken wires, rushing emergency equipment to a difficult spot. They even flew off aircraft carriers.

They could take off and land in the smallest kind of clearing. They rescued men from spots where no other plane could go. They saved thousands of American lives by rushing hurt men to adequate medical care before complications like peritonitis could destroy their chances for life. The time is here when every farming community without good hospital facilities should have a plane available as an emergency ambulance.

SOME of the airplane jobs we have mentioned here require skilled piloting. Crop dusting and seed sowing, for instance, are no work for amateurs. But there is plenty of talent in rural areas for such specialized work. A lot of the 300,000 pilots in the Air Forces were farm boys, and to them the air maneuvers needed for dusting crops will be practical. On the other hand, ordinary short distance flying in good weather is a simple enough job, with the planes we have now.

Not too many years ago the fellow who took flying lessons was supposed to be joining the Legion of Death. Modern plane design has changed that. The personal plane today is something a man of any age can learn to fly in a short time. The talk about flying being a young man's game applies only to military requirements—and not to piloting personal aircraft. I know men of more than sixty who are flying their own planes today. It's not years, but alertness and good judgment, that qualify a man for his license.

Cost of flying is a subject that concerns anyone who starts wondering whether he should have a plane of his own. You have heard it said that it's not the first cost but the upkeep that hurts. But here the farmer has an advantage over almost all other citizens. If he has a barn available, he may not need to pay for hangar space. He has enough land to maintain a flight strip of his own if he wants it, though some farmers may prefer community landing strips. A level mowed field makes an entirely adequate flight strip for some of the personal planes being made today.

Our new Stinson plane, for instance, the "Voyager 150," travels at 125 miles an hours, but stalls—lands—at a speed of only 51. And it's easier to fly than some of the planes that land at 40. Full load take-offs can be made in 550 feet, and landings at gross weight require no more than 230 feet landing run.

When it comes to the item of fuel, oil and replacements for a personal plane, the cost is very little if any more than for an automobile of comparable price.

The "Voyager 150," for instance, will fly for 8c per air mile (based on 250 hours per year utilization). It carries 944 pounds of useful load. This means that a farmer-pilot can take with him three adult persons and some baggage or cargo in a "Voyager."

or if he's alone he can carry 500 pounds of produce, equipment or supplies. As a family plane in which four adults can ride comfortably, the 8c per mile operation cost breaks down to 2c a passenger — cheaper than the passenger cost in any two-place plane. This explains why, mile for mile and dollar for dollar, the "Voyager 150" outoperates the smaller planes.

The two-place plane that some farmers are using will not carry a Pennsylvania farmer and his family to St. Petersburg for a winter's vacation, or to a national park in the west on a summer's jaunt. But the "Voyager 150" will even do that. Its incomparable over-all utility, as a plane in the medium price field, is one reason why we believe this plane is due to prove one of the best investments a responsible farmer can make.

Many farmers, for various reasons, may not wish to own planes of their own. But lots of these will club together in the ownership of planes which they will use by turns—just as many of them go partners in acquiring threshers and reapers and binders and other expensive farm machinery.

NOW it isn't just the personal plane alone that promises to make revolutionary changes in many a farmer's way of life. The airliner, and especially the air freight service we are now developing, are also going to play their part.

Consolidated Vultee recently used one of its experimental planes in a series of transcontinental flights carrying farm produce from the west coast to the east. One object was to learn how low a goal we could shoot for in air freight rates.

We were vastly encouraged by what we learned. For one thing, full payloads from east to west included items as varied as automobiles, grand pianos, and kitchen stoves. Once we moved the household furniture of several families simultaneously.

Flights carrying produce east from California gave us discoveries that seem of special interest to farmers. One air-shipper of California's rich Salinas valley, for instance, found that housewives would gladly pay an average of 10 cents a pound more for the fresh produce rushed to market by airplane.

When prices went above this premium, there was sales resistance, but the produce still sold. Airborne grapes for instance, brought 44½ cents in a city where the prevailing price was 27 cents a pound. Strawberries brought 59 cents, compared to a prevailing price of 29 cents a quart. You will note that these are hundred percent premiums. Cantaloupes were sold at 29 cents a pound instead of the usual 9½ cents — a 200 percent premium. OPA granted special price ceilings for the airborne foods.

Two facts seem evident in this. First, in every great metropolitan center there is an important core of people with incomes far above the average—and these people are the most profitable market any producer can reach. Second, these buyers are willing to pay premiums for fresh luxury and out-of-season produce which run far above the cost which air transport adds to the freight bill.

Probably the most important factor in the prices obtained was the fact that out-of-season produce was offered at retail within 24 hours after being picked in the Far West or Deep South.

In these test flights, carrying produce, the shipper used the lowest published air freight tariff for his cost computations — 26 cents a ton-mile. But that is a starting figure. We firmly believe, in the aircraft industry, that air freight rates before long can profitably come down as low as 10 cents a ton mile or less.

FOR example, we have a new passenger plane in the works at Consolidated Vultee, the Model 37, which will carry over two hundred passengers—in deluxe comfort —at a *direct* flying cost of only a little over four cents a ton-mile. Now, if we leave all the luxurious furnishings and equipment out of this deluxe passenger plane to make a cargo plane version, we double its payload capacity. That gets the direct flying cost for freight down somewhere between two and three cents a ton-mile. Even if we tripled that, to allow for all the indirect costs, we are on our way to rates below 10 cents for the ton-mile cost.

At that rate, some producers should even be able to ship lettuce profitably. Those big producers who buy and operate their own airplane fleets direct to market will get rates down even farther.

Farmers in the east will naturally ask how they are to benefit, if the airplane puts California and Florida produce within a few hours of the east coast markets. Is this going to take away some of their present income? The reverse will probably be true. The chances are that the American market for fresh produce is going to be vastly stimulated.

Millions of people in this country do not know what it is, for instance, to eat sweet corn on the day it is picked—though most farm families think corn even two hours old has lost its freshness.

Fifty percent of the total ton-miles of our national traffic in fresh produce goes just to carry what is consumed in New England and three other Atlantic states—New York, Pennsylvania and New Jersey. New York alone consumes 800 carloads of so-called fresh food products every day — enough carloads to make a train 7 miles long. Clearly, the market in the eastern states for fresh produce is so huge that imports from California and Florida will always be only a dribble by comparison.

Such imports, far from damaging the market for fresh produce that originates nearby, can only serve to build consumer demand for premium produce of the nearby area.

Air transport should help the eastern farmer benefit from this demand even more heavily than it will aid the western grower. Short-haul airlines, for instance, could put corn picked at dawn in Pennsylvania onto New York's dinner tables that noon. Air delivery may mean, eventually, that milk can be rushed swiftly to market at a fraction of the processing cost now required. In some instances, as in bringing the farmer a premium for day-old eggs, air transport should increase his gross income. In others, as in decreasing chances for spoilage, air transport should cut his costs and increase his net.

Most important of all, perhaps, is the fact that cheap air freight is going to give every farmer, no matter where he is located, a wide choice of markets that he previously could never reach by railroad; and that choice of market will automatically give many farmers a wider choice in the crops they raise. Forward looking farmers will see many an opportunity to step out in front and leave competition behind.

THERE has been pending in Congress a bill to appropriate a total of $650,000,000 over a ten-year period as Federal Aid for our nation's airports. All sorts of airports will be eligible, from the largest Class

The "Voyager 150" can take-off and land in a smooth pasture, and out-operates smaller planes.

V airfields down to the small Class I ports and the airstrips used for personal planes. As pointed out in the National Airport Plan submitted to Congress by the Secretary of Commerce, our biggest present need is for many more landing fields in rural areas. The Civil Aeronautics Administration estimates we need at least 6,305 airports in this country, to serve our needs in the next 5 or 10 years.

Just as the Federal Aid highways are only *incidentally* farm-to-market roads, so the 6,300 airports are only a part of the needed airport network. Landing fields right on the farms and at village crossroads are also a need. Plans have been proposed for an ultimate total of 25,000 landing fields across the nation, and some believe we shall eventually want such fields dotted from border to border, not more than 10 miles apart.

Good airports in our rural areas should produce great economic advantages. They will encourage the decentralization of our industries. They will establish new markets for the farmer, and broaden old ones. They will not only stimulate the growth of our smaller communities, but may encourage new ones to spring up.

We shall see many new local airlines organized, using smaller planes than most transcontinental lines, to link up with the national routes. They will give the farmer the same advantages which only large communities now enjoy in being linked by air travel, air mail, air freight, air express, and fast commnications of similar kinds. The Federal Aid Airport Act, called Bill No. 3615, is a good first step toward such a program, and is therefore a most important measure.

ALL industry has an interest in helping to increase the prosperity of our farms. It might be added that both industry and agriculture need a closer understanding.

A recent survey showed, for instance, that farmers' estimates of the profit made by industry during the war years averaged 37 percent. The farmers said they thought a profit of around 15 percent might be fair. The facts are, of course, that American industry even during the war years averaged a lot less than even that—the average was closer to 6 percent. The aircraft industry made a profit during the war of only 1.2 percent on its sales. Most farmers do a lot better—and should.

Business men know fully how the well-being of the whole country is linked to the farmer's prosperity. Business realizes too, that the farmer needs a far greater share of our manufactured products. Too many of our farms, for instance, are still not even electrified. Too few of them have even the common convenience of running water.

We should remedy such matters, and we shall. Consolidated Vultee, for instance, is now manufacturing a number of things, in addition to airplanes, that the farmer needs and wants to make rural life a better life.

We are now using production methods of unexampled efficiency, which Convair developed during the war, to build an entire new line of gas and electric kitchen stoves and ranges. We are planning to manufacture a wide range of farm machinery and implements. We recently entered the manufacture of motor busses, trolley coaches and specialized engines through purchase of a controlling interest in A. C. F.-Brill Motors Co., and its wholly-owned subsidiary, Hall-Scott Motor Car Co.

All of these things play an important role in improving life in rural communities.

It is certain that this air age which we are now entering will effect important changes in our economy and in our way of life, most particularly in rural areas. Predictions are always hazardous. But with due qualification, we may make a few:—

First: The air age will perhaps benefit the farm even more than the city. It will bring vast areas of rural land as near to the city, in point of travelling time, as the old suburban areas.

Second: The airplane should help to stop the decline of our farm population. The plane will put the city and distant friends in easy reach of every farmer's family—it will add an entirely new social dimension to rural living. This fact should help keep many young fellows at home. Their sisters will be able to get an order delivered by air express from a Sears Roebuck catalogue in two days—as fast as most city folks can get a delivery from a local department store. That will help farm life, too.

Third: Flying is going to increase many a farmer's income. The small plane will often enable him to handle operations on larger acreage. The large transport is going to bring him into closer touch with more profitable markets.

Fourth: The age of air transport is going to introduce many a citizen to the wide world, by putting the whole globe in his easy reach within 40 hours travelling time. (We used to say 60 hours for flying anywhere in the world, but advances in plane speeds has cut by a third the figures of only a few years ago.)

Fifth: Flying henceforth is going to get steadily cheaper in cost, just as it has steadily been getting safer.

Last, and most important of all, we can see the airplane bringing us a new freedom —freedom of choice, and freedom of action. The automobile brought millions this kind of freedom in a limited way. The airplane increases man's freedom of action many fold; the automobile by comparison is for stay-at-homers.

The STINSON SALES Plan

The new "Voyager 150" travels at 125 miles an hour, lands at only 51, can make full-load take-offs in 550 feet, gross weight landing runs in 230.

By WILLIAM A. BLEES

Vice President in Charge of Sales
Consolidated Vultee Aircraft Corporation

A LOT of money is going to be made by dealers in the aircraft business in the next decade. The Civil Aeronautics Administration, for instance, foresees as many as 400,000 civil aircraft in use at the end of this period. It has estimated that some 260,000 of these planes will be used for personal business and recreation, some 40,000 by business executives, another 80,000 by commercial aircraft services engaged in non-scheduled operations.

Some estimates of other agencies have run far higher. The CAA figures would mean a growth of approximately 30 percent per year in the planes in use. This may seem conservative, if compared with happenings in the automobile industry between 1900 and 1910.

In selling and servicing its own planes to the public, the Stinson Division of Consolidated Vultee is working through an organization of distributors and dealerships quite comparable to the system which the automobile industry has proved and tested through the years.

Before World War II, Stinson dealers were making good money, viewed as a return on invested capital. But no one in the aviation business was then making an

adequate return on the human energies invested. Salaries and drawing accounts throughout the industry tended to be low, compared with those in comparable fields.

This was true in the industry's manufacturing plants, where even the most brilliant engineers were sometimes glad to earn $5,000 a year; and it was true for many of the sales representatives. Those who were engaged in aviation enterprise in pre-war years were there primarily because the love

William A. Blees

of it was in their blood, and not because of high economic return.

To such unrewarded enthusiasm the nation owed an aviation industry ready to expand almost overnight when war came, and produce the mightiest air armada of the world.

But the war still brought relatively small financial reward to many of those who had been trying to promote aviation for years. Dealerships were disrupted; men who had been in the selling end of the business even found themselves out of jobs.

Now, with 1946, the aircraft salesman is emerging as one of the most important men in the industry. There are indications that he is going to reap rewards long deferred. For one thing, he is going to be selling in a climate favorable to his work—a great change from the day when personal aircraft were the playthings of a few pioneers. His potential market will not be limited to scattered aviation enthusiasts.

The war has educated scores of thousands in the human usefulness of the airplane. No salesman should hereafter have to sell aviation to a skeptic before he can sell a plane.

Salesmen can concentrate on demonstrating aircraft to converts who already think in aviation terms, and have only one chief question in mind: Can a personal plane do a job for *me?*

Many of these converts know pretty well what they want. In airplane design, surveys indicate this conclusively. Stinson's postwar line of planes has been designed with such survey returns right at hand. Five different models are projected, in a price range designed to give the Stinson dealer an entrée to every possible prospect.

The "Voyager 150", retailing for approximately $5,000 at the factory, occupies the middle position in this range. It is for sale right now, and orders placed now are to be delivered this year.

The Stinson line is to include (1) a low cost two-place plane; (2) a three-place plane for more versatile flying; (3) the "Voyager 150", which will comfortably carry three to four passengers on cross country flight; (4) the five passenger Sky Coach; and (5) a twin-engine junior executive transport, designed to carry five or six passengers.

THE "Voyager 150", spin-resistant, stall-proof, and equipped with a deluxe cabin so sound-proofed that only a low hum is heard from the mufflered engine, is already in production and will be seen in steadily increasing numbers this year on the 1946 airways.

In selecting its distributors and dealers,

The "Voyager 150" will fly for only 8¢ an air-mile, based on 250 hours' utilization per year.

The "Voyager 150" will carry 944 pounds of useful load—meaning that it will carry as many as four in complete comfort, together with baggage.

Stinson has made character and responsibility its first criterion. Stinson intends to make every effort to see that its distributors and dealers have a profitable business, backed by national advertising, aggressive merchandising, sound financing, and innumerable dealer helps. In return, Stinson wants dealers who will render to the customer a complete service unparalleled in aircraft history.

That is why the Stinson franchise carries with it the obligation to maintain service personnel who are qualified to deliver "one-stop" service and repair—men able to repair engines, accessories, props, and instruments right on the spot.

All parts are being standardized, and Stinson distributors and dealers are expected to carry a sufficient inventory to make all repairs promptly. The day when a part had to be ordered from the factory before a plane could fly again is rapidly disappearing. The excessive maintenance costs that formerly resulted from the need to send an engine or an instrument to some other town, for adequate servicing or repair, will soon be out of date.

The amount of operating capital required to handle such an operation depends largely on the potential of sales in the territory. A large initial investment is not required if the individual or company is in a position to obtain financial backing when needed. More important than financial reserves is the dealer's character, his fitness to operate properly, and his experience

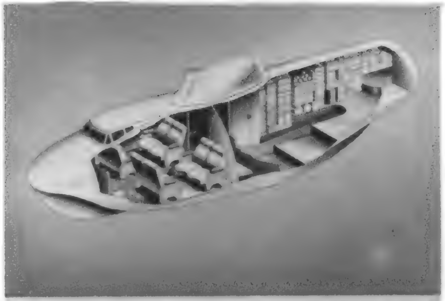
In the "Voyager 150", a dome-speaker replaces headphones in improved radio equipment. Dual engine mufflers and sound-proofing make this feasible.

in aggressive merchandising methods and serving the public.

Sales areas have been laid out scientifically, after extensive market surveys. Territories have been established on the basis of population buying power, and not on the geographic size of the area. So those who hold the Stinson franchise have assurance that able salesmanship and management will earn them satisfactory returns. This is a vital object in Stinson planning. The more valuable the Stinson franchise can be made to each individual distributor and dealer, the abler will be the men who compete for the opportunity of offering Stinson planes and service to the public.

Stinson dealers are being set up to render a complete service in their territories. They will have well planned buildings in which to show and service Stinson planes. They will teach people to fly, will charter planes for special trips, and will rent safe, dependable planes to qualified pilots.

STINSON has received hundreds of applications for franchises in the last few months; they started coming in even before the close of the war. Every applicant is carefully studied by a group of men who have grown up with the aviation industry, and who know the requirements of the different territories.



The Cats have Nine Lives

The famous Catalina, first designed in 1933, is even yet a modern and useful plane. In use for years as a long range military flying boat, it is now going to prove itself in commerce. *Air France* has been among the first buyers to acquire war-surplus Catalinas for conversion into commercial types. The planes are now being modified at Convair's San Diego division.

Commercially, the Catalina has previously been used with success over long water routes by the Rubber Development Corporation in South America and by the Quantas Airways, whose headquarters are in Australia.

The designs for five possible conversions that may be ordered are as follows:

Full de luxe conversion for passengers

Simple arrangement for 22 passengers

Half cargo and half passenger transport

Cargo or passenger transport, with removable seats

All-cargo transport.

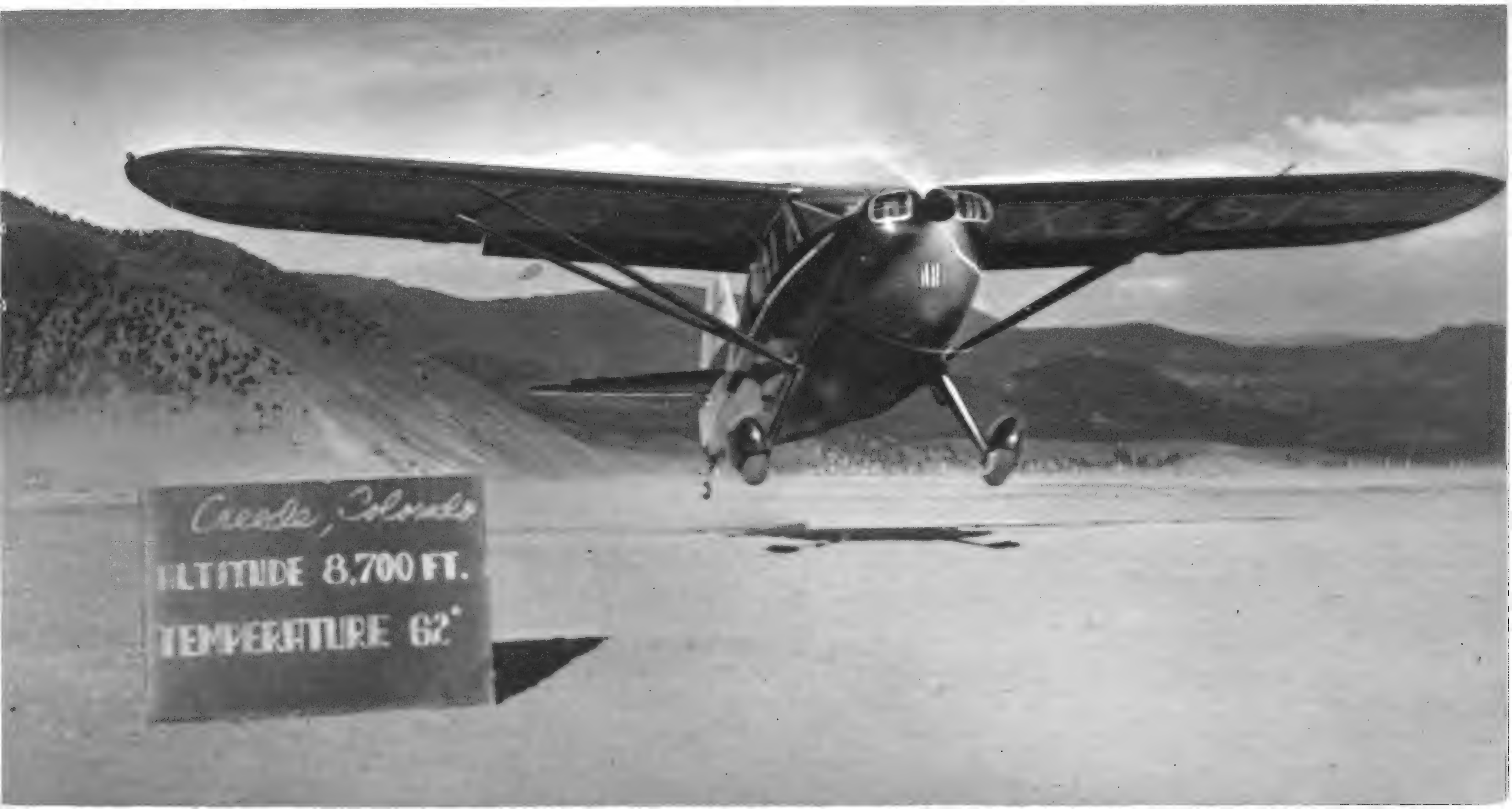
The automobile business, in its long history of selling and servicing transportation, has set up a pattern of organization and business guide posts that the growing aviation industry is bound to use with benefit. It has conclusively demonstrated, for instance, that the manufacturer's prosperity is dependent on working closely with distributors and dealers to make their franchises profitable. It has further shown that the dealer's income comes from many sources—new sales, used sales, service, parts and accessory sales. In addition, an airplane dealer will get income from other services that the automobile dealer cannot render to his customers, such as chartering, rentals and teaching.

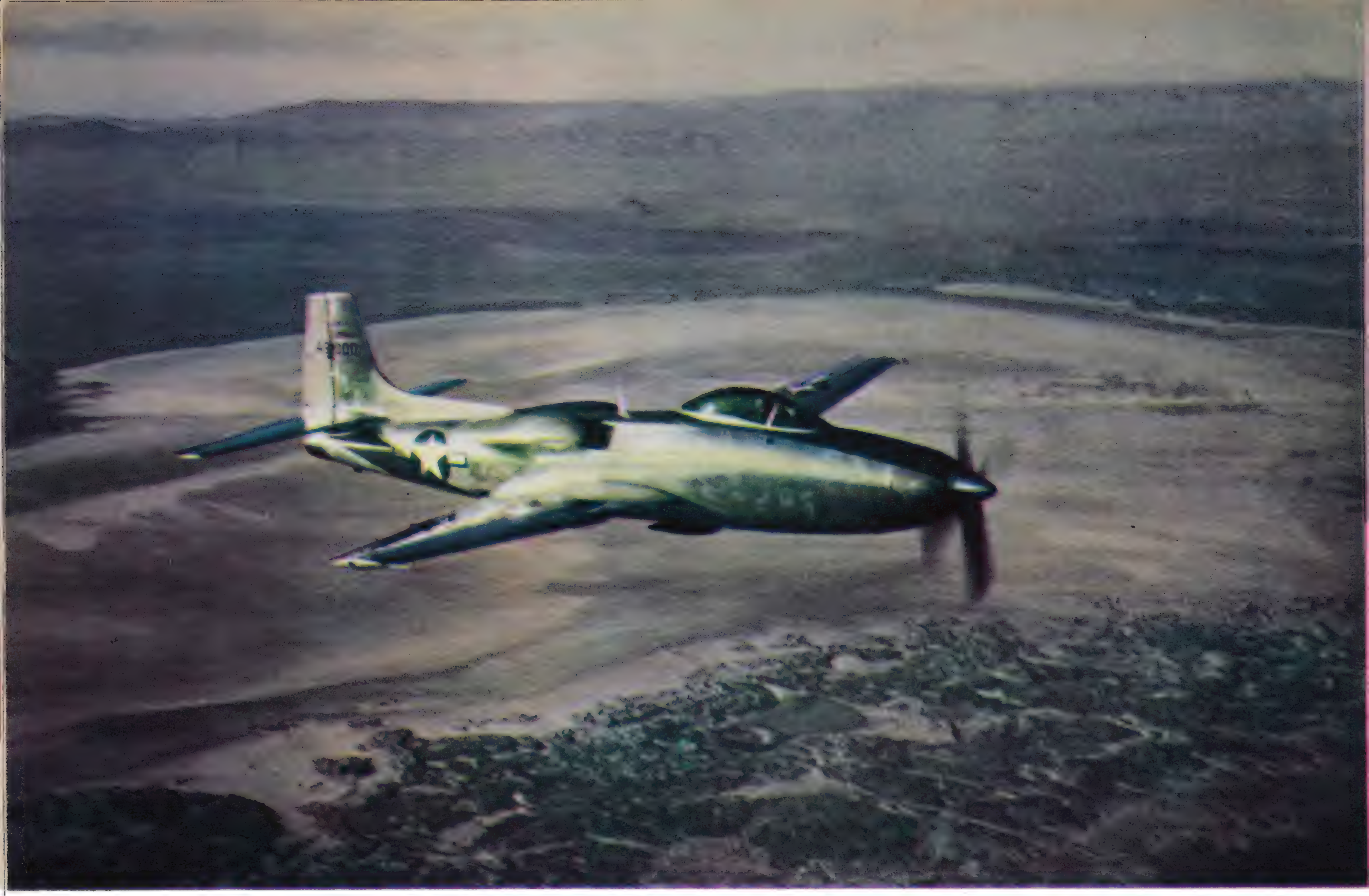
Today's established methods of installment financing, which had to be developed slowly, now can be adapted to the plane buyer's needs almost without change.

In building volume sales, Stinson is taking advantage of all these tried and proved business building methods.

Stinson is not rushing into the post-war market with a large production of cheap airplanes. Stinson is proud of its reputation for building quality aircraft for airmen—safe and dependable planes carrying a name known for years as the best in aviation. This reputation is to be zealously guarded, both in Stinson post-war designs and in their merchandising to today's growing market for personal aircraft.

In high altitude performance tests 8,700 ft. above sea level, the "Voyager 150" was airborne in less than 1350 feet, carrying a capacity load.





Convair's new XP-81 has two engines, both burning kerosene; one drives the propeller, one provides jet propulsion. Its speed exceeds 500 mph.

The powerful XP-81

DESIGNED and built by Consolidated Vultee for the Army Air Forces, the XP-81 is the most powerful fighter in the world; it has a speed of more than 500 miles per hour. It is powered by the revolutionary General Electric gas turbine engine driving a propeller, known as a Propjet, and a separate jet engine. The combination power units can produce virtually as much power as all four engines on a B-29 Superfortress.

The XP-81 is an all metal, low wing, land monoplane, equipped with a tricycle landing gear. Its length is 44′8″; its wingspan is 50′6″, and height 13′6″. Gross weight of the single seat fighter is 19,500 lbs.

In this one plane, Convair engineers have combined the high efficiency of the propeller for quick take-off and long-range operation, and the jet engine for very high speeds.

Performance data for the XP-81 are still secret. But its long range and high speed, apparent with disclosure of the power plants, are phenomenal.

The XP-81 has the distinction of being the first plane to fly with a gas turbine engine designed for propeller drive. A four blade propeller is rotated by the powerful gas turbine unit in the nose.

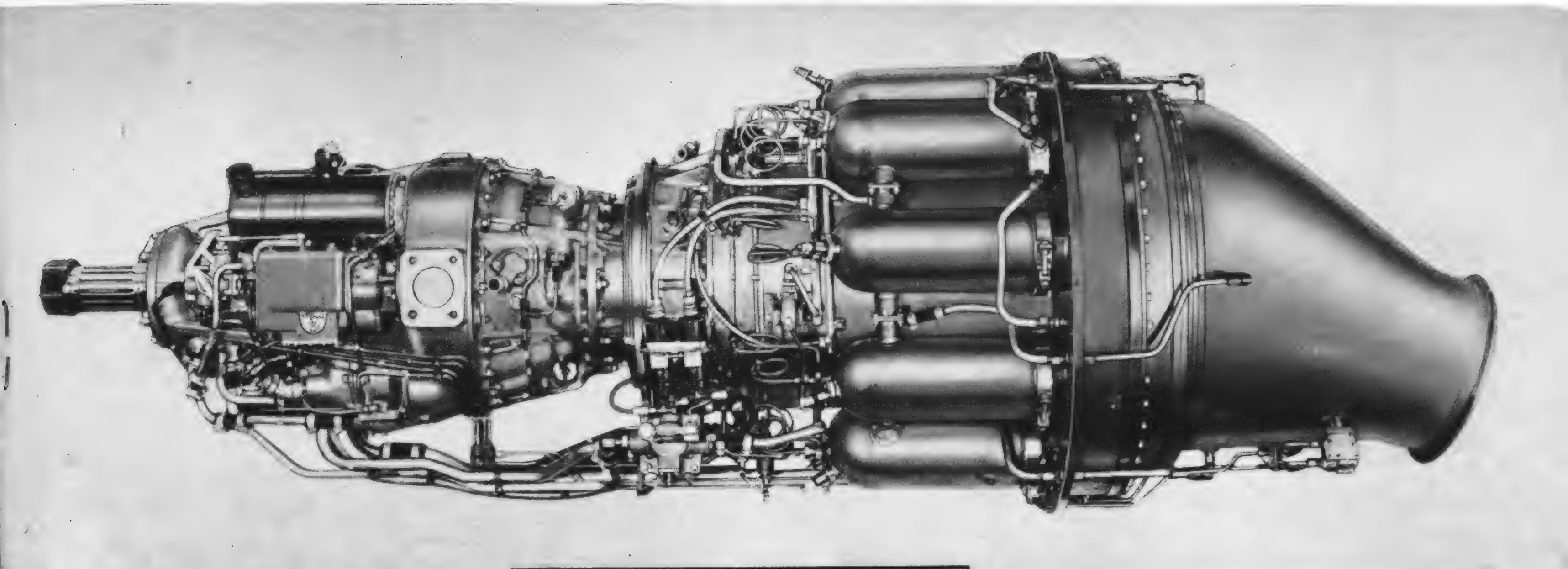
From outward appearances, the XP-81 seems to be equipped with a conventional reciprocating engine in the nose. But underneath the cowling is the recently developed gas turbine engine, known as TG-100, whose operating characteristics are now being tested for the first time.

This G-E engine in the nose is known as an axial flow compressor type. The G-E unit in the aft section of the fuselage is a centrifugal jet engine known as the I-40—the same type used in the Shooting Star P-80.

The gas turbine engine in the nose, in combination with a propeller, develops considerably higher power than conventional engines, at less weight, and with improved operating characteristics. Its success in the XP-81 is the beginning of a transition towards the use of gas turbine engines driving propellers in long range, high speed aircraft.

Similar engines are being considered as power units for the giant intercontinental 204-passenger transport, the Convair-37.

The second engine, also built by General Electric, is the commonly known jet type, designated as the I-40. In the XP-81, both the propeller and jet engines are used for take-off. For cruising purposes, the front engine is generally used. But the plane can fly on both engines, or either one. Normally, the rear jet engine is used only when



exceptionally high speeds are necessary.

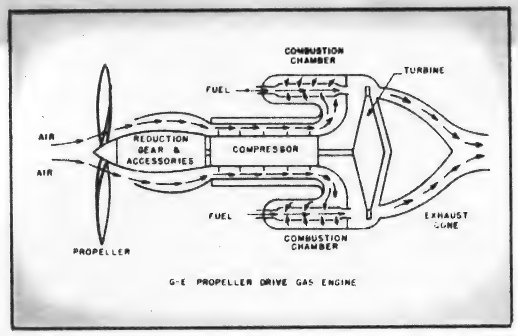
Both engines burn kerosene, obviating the need of separate fuel systems, and reducing the danger of fire from high volatile fuels used in conventional engines. Neither engine requires a warm up.

An appreciable amount of thrust is also obtained from the front engine through the exhaust jet directed under the fuselage near the center of the plane. Conventional in other ways, the XP-81 is distinguished by these twin engines, which give the fighter maximum performance at low altitudes and substratosphere levels.

The wing is an NACA laminar flow type, with an area of 425 sq. ft. A smooth airfoil has been obtained by unique methods of construction, which include the use of heavy aluminum-alloy skin. The stressed-skin wing is flush riveted, and rivet heads are milled. Because of the heavy skin, no dimpling occurs during assembly. Thus a smooth aerodynamic surface is obtained without the necessity for painting and other treatment to fill in depressions.

The heavy plating is applied on the forward 34.5% of the wing, and this area comprises the structural torsion box and main spar, extending to the center line of the fuselage. The aft part of the wing is semi-structural, and provides adequate strength for support of equipment, ailerons and flaps. Cover plates are designed in the wing to permit quick access to all parts for inspection and repair.

Thermal anti-icing, pioneered by Convair on the Catalina flying boat, is used to protect the wing and empennage surfaces from ice. Hot air, derived from the pressurized air of the TG-100 engine and heat from the exhaust stack, is carried in ducts to the forward sections of the wing and tail surfaces.



The engine driving the propeller is a gas turbine called the "Propjet", made by the General Electric Co. Gases from compressed air and burning fuel pass at high velocity and pressure through a turbine revolving at a speed of more than 10,000 times a minute.

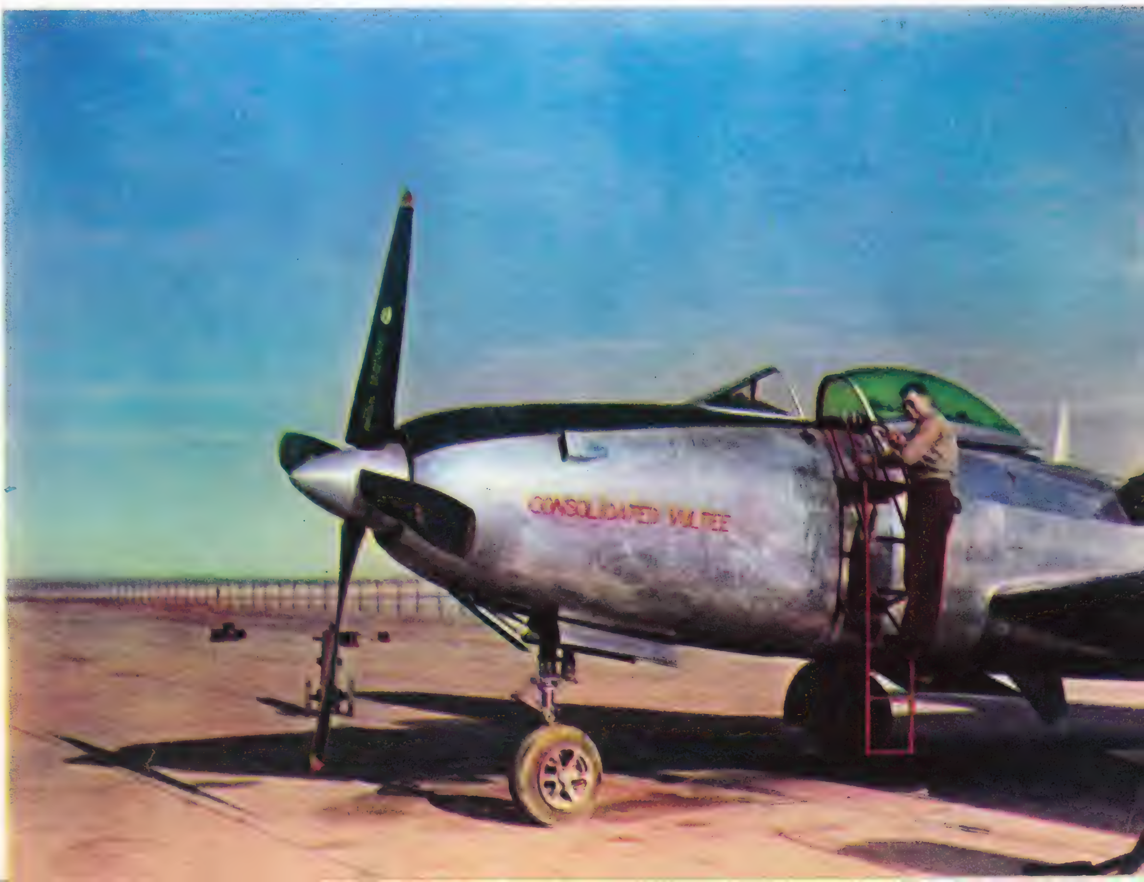
Space is provided inside the wing to house the main landing gear completely, and to install several guns. The tricycle landing gear is powered by electric motors. An emergency method of operating the gear is provided in case of electrical failure.

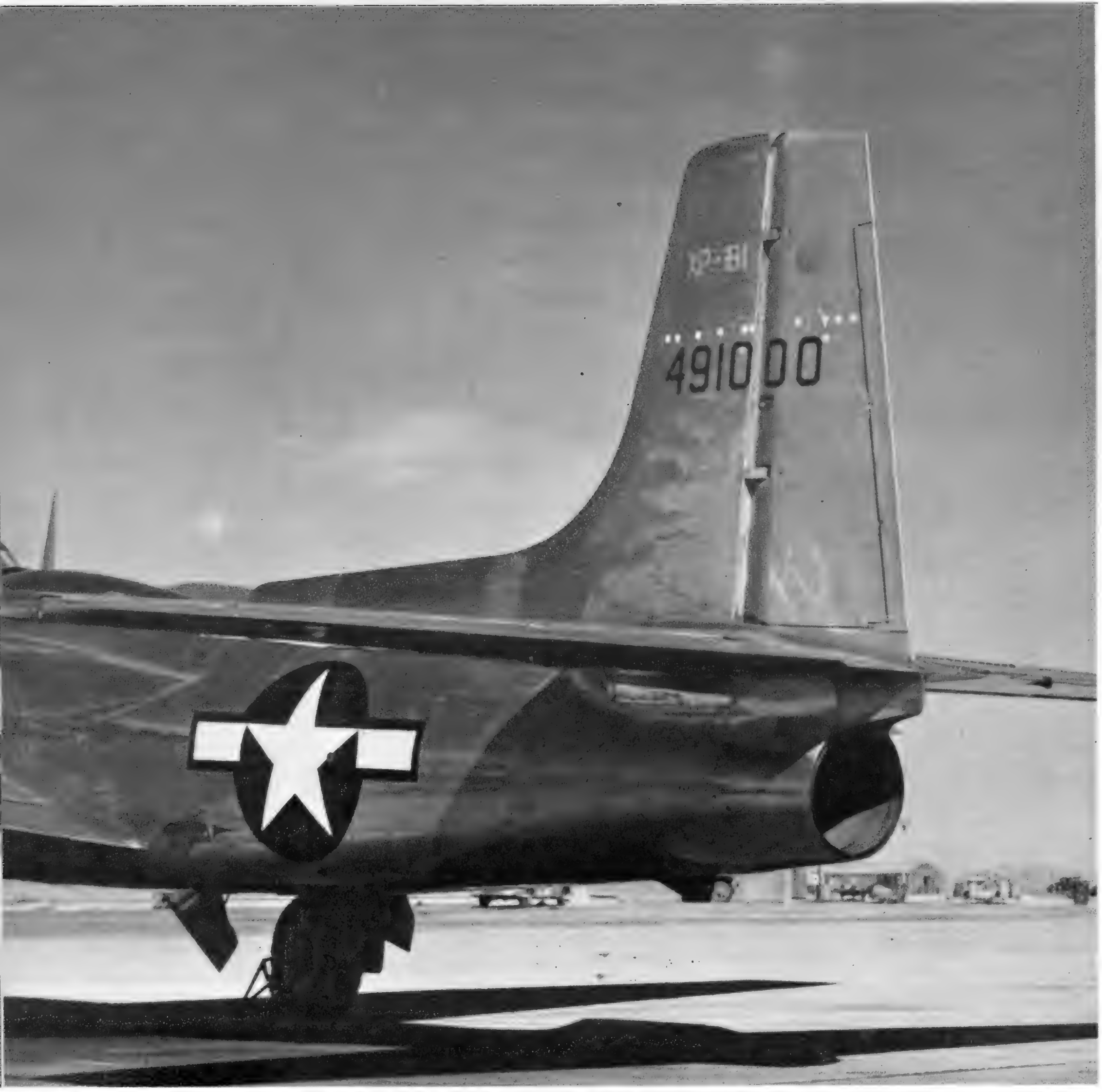
Extensive use of age-hardened aluminum alloy, called 24S-RT, is made in the fuselage, which is of semi-monocoque construction. Flush riveting on exterior surfaces is featured to improve aerodynamic characteristics.

A bubble-type canopy covers the pilot's compartment. The transparent enclosure slides aft, and stops are provided for several intermediate positions. Under development is a device for catapulting the pilot from the cockpit in an emergency. It will be similar to the apparatus first developed by Convair for the XP-54 experimental fighter.

The cabin is pressurized by air from the TG-100 compressor. Refrigeration is also

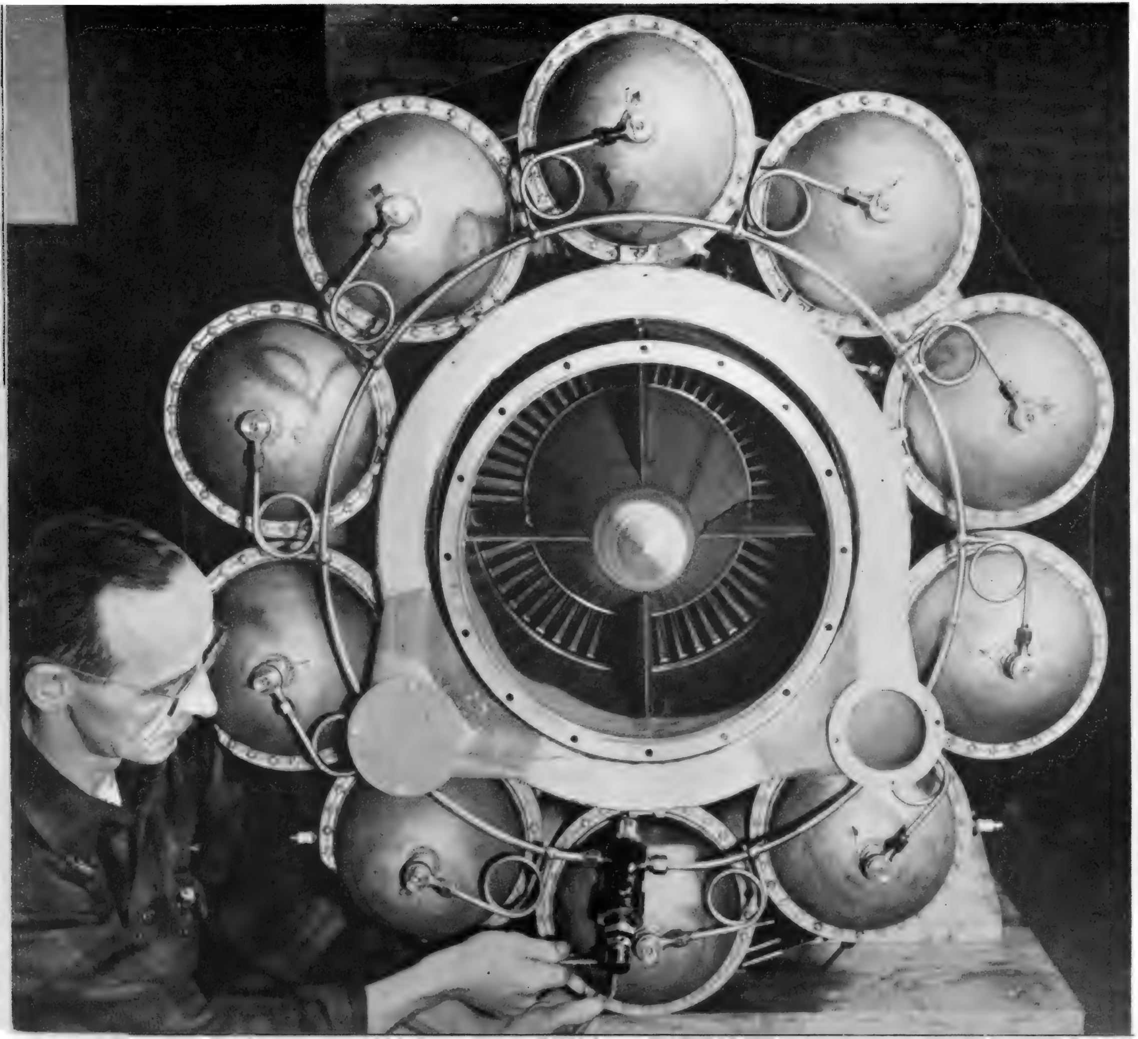
The nose of the XP-81, with gas turbine engine, looks conventional. For the tail, turn the page.





Above: The tail of the powerful XP-81, where the jet engine is installed. The plane can fly on both engines, or either one. Normally, the rear jet engine is used only for very high speeds.

Below: This is the turbine in the G-E Jet, which revolves at a speed of over 10,000 times a minute in heat more intense than 1,500° F. The jet exhaust cone is removed to show the one moving part.



provided to maintain comfortable cockpit conditions regardless of the climate or altitude. An automatic pilot to relieve pilot fatigue during long periods of operation is installed in the plane.

Large air scoops are designed in the sides of the fuselage to admit air to the I-40 jet engine. The TG-100 gas turbine engine obtains air through an annular scoop at the front of the engine.

Internal fuel tanks are located just aft of the pilot's compartment. For long range operation, provision is made under the wing for carrying external tanks which can be dropped when the kerosene used as fuel is consumed.

Performance characteristics of the XP-81 make it adaptable not only as a long range bomber escort, for which it was primarily designed, but also as an intercepter fighter. Its heavy fire power makes it an effective weapon against armored columns and tanks, and its ability to carry bombs and rockets makes it useful for attacking strong positions.

CREDITED with the major design work on the new fighter plane are C. R. Irvine, chief development engineer at Convair's Vultee Field division, and Frank W. Davis, assistant development engineer and test pilot.

Design of the XP-81 started in September of 1943, when Convair submitted a proposal to the AAF.

Equipped with a Merlin power plant and the I-40 G-E jet unit, the XP-81 made its initial test flight at Muroc Army Air Base on February 11, 1945, thirteen months after receipt of the contract.

When the General Electric TG-100 was ready for trial, it was installed in place of the Merlin, and the initial flight test with this engine was made on December 21, 1945, at the Muroc flight test base.

The new fighter with its increased power performed up to pre-flight expectations, and on that date, another milestone in the advancement of aviation was reached.

Models were tested in high speed wind tunnels at NACA, the GALCIT tunnel at Cal Tech, and in one operated at Convair's Vultee Field division.

Cooperating with Convair engineers on the XP-81 project was the engineering department of the Air Technical Service Command, Wright Field.

Stimulating Invention

GREAT investment in research, and constant stimulation of invention, are cardinal policies with Consolidated Vultee.

It is invention that has given America a preeminent place among the world's powers. Hence the problem of maintaining a social and economic climate in which the inventive spirit can flourish is one of the most important challenges that thoughtful observers see facing us.

The patent plan of Consolidated Vultee, devised to encourage employee-inventors to develop new ideas, operates by offering the inventor every aid for his work which the corporation has available.

The plan being administered at Company divisions by a group of specially trained patent engineers, under the direction of G. T. Gerlach, has three specific objectives:

(1) To establish a clear-cut Company policy in regard to employee inventions;

(2) To enable all employees to earn extra compensation when their patentable ideas are used by other manufacturers; and

(3) To protect the Company by providing a procedure whereby all Company inventions are brought to the attention of the patent department for patenting, or so that steps may be taken to avoid the unlicensed use of patents held by others.

When an invention appears to have merit, the patent department conducts a thorough investigation; if the idea is found to be patentable and the Company decides to file an application, the inventor is given an award of $50 when the application is assigned. Then when the patent has been granted by the Government, a second award of $50 is made to the inventor. Thereafter, the inventor's income depends wholly upon the success with which his patent can be commercialized. If the Company does not wish to patent the invention, the inventor is given a release.

Although it has been in full force for less than four years, the Consolidated Vultee patent plan has already resulted in the filing of a large number of patent applications, which cover almost everything from toys to super-airships.

Some of the more interesting inventions that are being or have been developed in accordance with the terms of the plan are the Metlbond adhesives, which form metal joints that are stronger than riveted joints; Conolon, a new-type plastic laminate which is stronger and more durable than most of the aluminum alloys now used in constructing airplanes; Zipseal, a new synthetic rubber product which will prevent leaks in aircraft fuel tanks; the improved insulating pad which is of great usefulness in sound proofing and high altitude flying; the Clegern Turbo Hood, which enables an ordinary aviation engine to attain some of the advantages of jet propulsion; and the Bordelon-Ehlers Engine Performance Indicator, which will prevent many post-war airplane accidents by giving advance warnings of engine failures.

"The outstanding value of our patent plan lies in the complete elimination of employee controversies regarding patent rights," says Patent Director Gerlach. "In almost four years of operation, there has not been a single case of a Company-employee dispute over the ownership of an invention—due mainly, we believe, to the patent plan which clearly defines the rights of each party."

"A less tangible but an equally important benefit," he continues, "is the fact that the generous terms of the patent plan offer a real incentive to employees. The interesting fact that nearly half of the inventions submitted are outside of the aircraft field certainly proves that the cooperation by employees is on a wholly voluntary basis."

The Experimental XA-41

DETAILS of a new military aircraft, a close support plane constructed experimentally during the war by Consolidated Vultee Aircraft Corporation, were revealed, with permission of the War Department, in the spring of 1946.

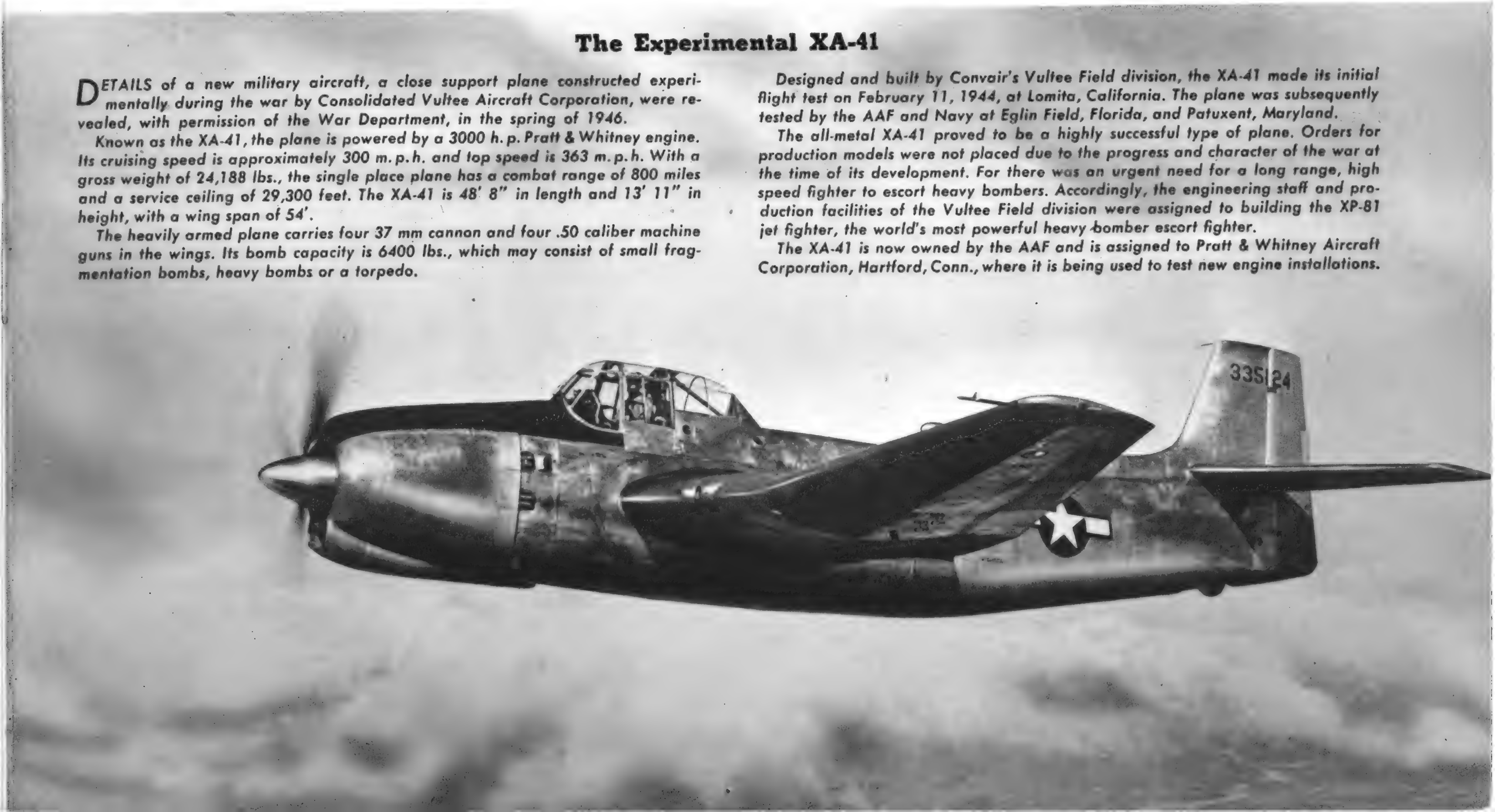
Known as the XA-41, the plane is powered by a 3000 h. p. Pratt & Whitney engine. Its cruising speed is approximately 300 m. p. h. and top speed is 363 m. p. h. With a gross weight of 24,188 lbs., the single place plane has a combat range of 800 miles and a service ceiling of 29,300 feet. The XA-41 is 48' 8" in length and 13' 11" in height, with a wing span of 54'.

The heavily armed plane carries four 37 mm cannon and four .50 caliber machine guns in the wings. Its bomb capacity is 6400 lbs., which may consist of small fragmentation bombs, heavy bombs or a torpedo.

Designed and built by Convair's Vultee Field division, the XA-41 made its initial flight test on February 11, 1944, at Lomita, California. The plane was subsequently tested by the AAF and Navy at Eglin Field, Florida, and Patuxent, Maryland.

The all-metal XA-41 proved to be a highly successful type of plane. Orders for production models were not placed due to the progress and character of the war at the time of its development. For there was an urgent need for a long range, high speed fighter to escort heavy bombers. Accordingly, the engineering staff and production facilities of the Vultee Field division were assigned to building the XP-81 jet fighter, the world's most powerful heavy-bomber escort fighter.

The XA-41 is now owned by the AAF and is assigned to Pratt & Whitney Aircraft Corporation, Hartford, Conn., where it is being used to test new engine installations.



Lower-deck lounge on the new Convair-37, a six-engine plane that will cruise 310 to 342 m.p.h.

Foreign Markets for our Planes

An International Survey

By Harvey C. Tafe

Consolidated Vultee during the war had company representatives stationed all over the globe, to help the AAF with service and maintenance work on Consolidated Vultee planes. Its officials are therefore well informed on world developments in aviation. Mr. Tafe, author of this summary, is Washington representative in charge of all export sales for Consolidated Vultee and its Stinson Division, operating under William A. Blees, Convair Vice President in Charge of Sales.

It looks as if foreign business should boom for American aircraft — the best engineered and best quality planes in the world. But the situation isn't that simple. If you analyze the world, nation by nation, you will see why the American airplane manufacturer is going to have to fight for every dollar's worth of foreign business he gets.

Some of his heaviest competition will be with Great Britain. In eager pursuit of foreign trade, Britain is placing special air ambassadors in all prospective purchasing countries.

The British long ago learned the advantages of cultivating foreign markets in the early stages of their development.

The United States enters the post-war race for foreign trade with the knowledge that Great Britain is still the champion. The projected U. S. to Britain loan is intended to avert a trade war between us, and equalize competitive conditions. But, for at least a whole year, British products can be rushed into export, under the shelter of Empire protection. These exports are intended to make friends even while they make Britain money—friends whose trade will be retained in the future.

Reported statistics show that the aircraft manufacturers in England may now have as many as 800,000 workers employed, which is almost half the total personnel that they employed during the war. Almost all their effort is being directed toward large production for export.

Although the British, like the French, Swedes, and a few other nations, are purchasing some new American equipment, this apparently reflects no permanent policy. At the moment, they have an immediate need of modern airliners to fulfill their contracts to operate their international routes. Without modern equipment they could not compete with American airlines, or develop their trade routes. Furthermore, their purchases of modern U. S. equipment will guide their engineers in designing new production of their own, which later is to compete in world markets.

In the months immediately following the war, the United States has seemed to have at least one sales advantage of its own—the ability to furnish airplanes to foreign countries quickly, airplanes that were war-surplus. Even the British airlines have been using United States equipment temporarily. Many other foreign lines, such as KLM, Swedish Airlines, Iceland Airways, and Belgian Airlines, have also been purchasing our war-surplus air transports.

If the Americans can follow up such surplus sales with offers of quick deliveries of new airplanes—which will be much cheaper to operate, and will have higher speeds — some of these airline operators may buy the new American equipment ultimately. And some of them may keep on buying it; to change *types* of airline equipment is a tremendous expense, because of resultant changes in flight training, ground handling and parts supply.

Hence selling or leasing our surplus transport airplanes to air transport companies in friendly nations may help establish American aircraft permanently in the operations of certain foreign airlines.

Our Government's Surplus Aircraft Sales Center at Miami, Florida, is an interesting exhibit. The Army Air Forces and the Foreign Liquidation Commission of the War Assets Board have taken a large building (250,000 square feet) at the Miami Air Base as a showroom for aircraft and supplies.

The first purpose of this Sales Center has been to sell South American countries the surplus aircraft equipment of the Army and Navy. Later, other countries will be invited to purchase. Airplanes, parts, radios, instruments, tools, ground handling equipment and even flight clothing are being offered. Merchandising methods equal to anything offered by any private business are being utilized.

These sales of surplus planes are not necessarily competitive with the market for our new aircraft—they may help to expand and stimulate it.

But a real challenge exists in this Government operation. Manufacturers who visualize the horizons it opens to them need to follow up these public sales of surplus aircraft with aggressive merchandising. Our manufacturers may find that resulting orders will not immediately show a profit. But this early missionary work will give them many future advantages over competitors.

This upper-deck lounge of the Convair-37 is part of the unique facilities for 204 passengers.

It is not in Europe that our most promising foreign market for American aircraft lies. Britain will naturally want only British built planes on her global airlines.

Holland and Sweden had their own flourishing aircraft industries before the war, and want to have them again. France, like Britain, is trying hard to strengthen her economy, and intends to build her own aircraft hereafter, just as she did before her collapse. Germany and Italy are out of the picture. Russia remains the great unknown, and the territories where she has assumed control seem no longer promising markets for our products, either.

In the Pacific and Far East we can likewise see no extensive markets for our aircraft. Australia, for instance, has developed an infant aircraft industry of her own, and protects it with a high tariff. China—at least for a while—will offer only a limited demand for military planes and perhaps war-surplus transports. Siam, Thailand, French Indo-China, will offer only small markets, at best. In India, where plane transportation is a vital need, British affluence is dominant, and we should find it hard indeed to compete with the British in their own backyard.

The Convair-37 has two decks, will fly from New York to London in approximately 9 hours.

We come inevitably to one conclusion: the really attractive markets abroad for our aircraft lie largely right in our own hemisphere—in Latin America and Canada. We may add to this other limited areas like the Middle East, the Philippines, and the Union of South Africa. But most of the foreign business is near at home.

Of all the regions where airplanes are urgently needed, South America is the one ready market where the American manufacturer can be certain of a real volume of export sales.

Most of the important South American countries enjoyed unexampled prosperity during the war, and piled up large dollar trade balances by selling numerous supply articles to the United States Government. These dollars are now available for purchases of imports from the States. Further, a preference for our aircraft seems assured.

The United States Government has seen fit, under the Good Neighbor Policy, to lend-lease large numbers of our airplanes to South America, and has sent Air Missions into almost every South American country to train native pilots. South American students have also been brought to the United States for air and technical training.

Such a policy is being continued since the war ended. The result is that South American countries have learned to appreciate the quality products of American aircraft manufacturers—products which they were usually unable to purchase prior to World War II.

They have been able to compare our aircraft with some of the cheaper airplanes they once secured from Germany, France, England and Italy. With the possible exception of Argentina, they are ready to purchase American airplanes, even on the cash terms demanded by most American manufacturers.

Brazil is outstanding as a prosperous nation that holds over $3,000,000,000 in favorable balances accumulated during the war. Practically all of her commercial and private airplanes now in service are ten years old. With an area larger than the U. S. A., Brazil has vast unexplored territories inaccessible by the country's comparatively undeveloped railroad and highway systems. Wealthy land-owners with their large *fazendas* are eager for airplanes with which they can commute to their scattered holdings. The mining industry and the rubber industry also need aircraft, to reach isolated locations. Above all, the country's airlines need it.

A recent market research report estimates that there should be a Brazilian market in the first post-war year for about 300 2-place airplanes, 250 4-place airplanes, and about 75 planes of various types for airline equipment. At the present time the Brazilian airlines are operating 75 transports of various makes which are between five and ten years old.

In Brazil there are 6,540 licensed pilots, and it is estimated that 1,500 additional civilian pilots will be trained during 1946. Furthermore, there are 240 government-sponsored Aero Clubs in Brazil. All this is a gauge of the nation's great interest in aeronautics.

In Argentina the topography of the country is excellent for air operations. While there are 150 registered airports, you can "set down" an airplane almost anywhere in the open country. But we have had political differences with the Argentine government, and we have not as yet been able to sell airplanes to Argentine purchasers.

Market surveys indicate that there is an immediate requirement here for from 600 to 800 airplanes. But North American manufacturers still stand outside. Great Britain meanwhile is developing her contacts in Argentina, has recently sold four Short Sunderland Flying Boats to one of the large airlines, and has opened up offices in Buenos Aires.

Uruguay, although a comparatively small country, has shown great interest in the development of aviation, due to its closeness to Buenos Aires and the extremely heavy air traffic between that city and Montevideo.

With a topography similar to Argentina's, Uruguay is an easy country to fly around in. There are 21 designated landing fields in Uruguay, and many landing strips on the numerous ranches. There are 880 registered private pilots and 21 registered Aero Clubs.

Uruguay has an immediate need for about 100 private airplanes of the 2-place and 4-place class. There are two domestic airlines in operation; their present equipment consists of old German seaplanes and twin-engine English transports. The market analysis indicates that they have immediate need for about 10 single-engine aircraft for airline feeder work and for perhaps 10 of the twin-engine type, and also several large flying boats for the traffic between Buenos Aires and Montevideo.

Two luxury bedrooms on the Convair-37 may be combined by folding back a separating partition.

Chile, with large dollar balances from the export of nitrates, also offers good prospects. The Government has aided aviation by developing Aero Clubs around the large cities, and now requires by law that persons trading in aircraft must have a registered engineer in their employ qualified to inspect and certify that airplanes are in good shape.

Chile is handicapped in areas available for airports, in that the country, is strung along the coast, with the high Andes along the back. But a budget of 300,000,000 pesos for airport development is being met through gasoline taxes, and an extensive airport development is under way, with an ultimate expenditure of 1,500,000,000 pesos.

In the coming year the country could probably utilize 200 of the 2-place aircraft and 125 of the 4-place. British Latin-America Airlines (BIAIR) will use British airplanes, and Great Britain already has taken Miles "Magisters" to Chile for use by the Aero Clubs. But the National Airline (LAN) now operates 10 U. S. A. transports, and is in the market for 25 new airplanes, ranging from single-engine to 4-engine. Panagra (Pan-American subsidiary), which also operates in Chile, will, of course, purchase U. S. planes through Pan-American. Cruzeiro do Sul, a Brazilian airline operating to Chile, will also use U. S. airplanes. Cia sud America de Vapores, a Chilean steamship line, is just starting operations and is also in the market for U. S. airliners.

Colombia, with heavy dollar balances derived from war-time sales of tin, does not use the airplane as extensively as some other countries, partly because of extremely mountainous terrain. Most airports are above 7,000 feet above sea level. But airlines here are using converted war-surplus airplanes to carry passengers and freight into the mining region. They also haul machinery and laborers from the ports and return loads of processed ore to the coast. While Colombia will probably not purchase over a hundred airplanes of all types in the next year, the market is developing.

Peru has long carried freight by air, and her commerce will be enormously developed by the new type of airplanes now available. Like Chile, Peru is surrounded by mountains on one side and ocean on the other, and has comparatively few places for landing fields. The private plane market in Peru will be limited. But there is a need for numerous commercial-type airplanes for flying into the hinterlands where rubber development and mining is conducted.

Faucett Airlines (the main native airline) has been using Stinson Reliants and tri-motored Stinson A's for a number of years in carrying freight and passengers from Lima to inland towns. During the war, a number of Catalina PBY's were also used in Peru in work of the U. S. Rubber Development Corporation. Airport development programs are being started, and several new feeder lines have commenced operations between Lima and coastal cities. All are endeavoring to obtain U. S. equipment.

Bolivia, comparatively small and mountainous, will need airplanes for freight hauling, due to the lack of railroads and highways, but will have comparatively little development of private flying.

Venezuela, while comparatively rich through its oil production, has its wealth concentrated in a way that limits the mar-

Note the spiral stair back of stewardess. Only 17 seats of the 120 on the upper deck appear here.

ket for airplanes. Government control over the development of the airlines and civilian flying likewise limits the market in Venezuela for personal aircraft. The airlines will probably purchase their airplanes in the United States through their holding companies.

Mexico offers us an important aircraft market. Though her industry is nationalized in many ways, aircraft manufacturing has not been developed to handle the demand. Mexico City is the focal point for business. Even those people having large mining or oil properties, or large ranches in remote areas, center their business in Mexico City.

Many new airlines have started up. The main Mexican airlines — Compania Mexicana de Aviacion, Pan-American, American and Braniff — purchase United States airplanes. Smaller airlines use surplus or converted U. S. airplanes. Steadily increased business makes a demand for more equipment. The present number of airline airplanes of all types being used — approximately 50—will probably be tripled within two years. Freight-carrying airplanes are rapidly being put to use; this freight business can prosper because of the inadequate railroad and highway development.

Appointments on the Convair-37 are sumptious. Pan-American is buying a fleet of these planes.

While personal flying will not be extensive, and will be confined to the wealthy and to members of Aero Clubs, interest is mounting in Mexico City, Vera Cruz, Acapulco, Mazatlan and Monterey. An immediate market for 150 new personal airplanes is apparent. Some wealthy businessmen want small 2-engine equipment for visiting their holdings; in the mountainous terrain, cross-country flying is safer with two engines.

Central American countries like Panama, Costa Rica, Guatemala, Honduras, and San Salvador, will purchase few airplanes individually, but the over-all market is worth seeking. A number of our former Air Force pilots are developing airports and service facilities in these countries which were previously neglected. These former Air Force boys will naturally act as ambassadors for United States aircraft.

Canada offers us a market really worth having. While Canada had an aircraft manufacturing industry of her own during the war, the number of airplanes sold there domestically would hardly warrant continuing large aircraft factories in that country. Many Canadian pilots flew American airplanes in the war and liked them. As these men return to private life, many of them are starting local airfields and are eager to purchase United States equipment. The one drawback is the Canadian tariff on our manufacturers, which makes American airplanes highly expensive for Canadian citizens. Plans are under way in the hope of developing a reciprocal trade agreement on airplanes and parts, to enable purchasers in Canada to buy airplanes at approximately the same price as in the United States.

ON beyond this hemisphere are two other spots where American aircraft should find ready purchasers. One place is the Middle East; the other, South Africa.

The Union of South Africa, populated by some two million white people, has granted subsidies to all its towns for maintaining air-strips. Today South Africa probably has more landing strips in proportion to population than any other country in the world. Having enjoyed a well-rounded prosperity during the war years, South Africa has adequate financial balances.

Although part of Britain's Empire of Great Britain, the Union is controlled economically by Holland-Dutch descendants who still remember the Boer War; some would rather purchase airplanes from the United States than from Britain. Railroads and highways are still under-developed, and there is a fertile field for growing air traffic between the cities. While the main market lies around Capetown, Johannesburg and Pretoria, there are innumerable scenic spots in South Africa which are inaccessible to tourists by any other means than air transport.

The Middle East area also offers us customers. Its people learned much about us during the war from the Air Transport Command and our Army Air Forces bases. Many GI's and American officers have liked this section of the world enough to stay there and develop businesses.

Great numbers of small commercial planes and larger airline equipment are needed for transportation between cities that are from 200 to 400 miles apart, and have no interconnecting railroads or highways. Flying boats and amphibians will also be in demand to take care of inter-island traffic.

It is clear, as we count such prospects for selling our aircraft abroad, that the opportunities are not unlimited in scope. But they are worth going after. Diligence in cultivating every possible sale will not only bring our aircraft industry needed business, but will also create and maintain prestige for the American nation among the other peoples of the world.

Above: **The magnificent airport which American funds helped construct at Karachi, India.**

What about our Foreign Air Bases?

By Ray W. Bonta

Left: **Observation tower at our Tripoli base.**

The author of this article, in his capacity as Captain in the Air Corps, in late 1945 made a 40,000 mile inspection trip of ATC bases stretching from the United States to Chungking, coming back through Europe and home by way of Iceland and Labrador. His personal views do not necessarily reflect those of the War Department or Air Transport Command.

ONE good result of trips that various Congressmen made last year to Europe, North Africa and the East is the knowledge they got of global air travel. They saw what not all Americans seem to realize—that the global airline system founded by ATC wasn't a chain of airplanes; it was really a chain of bases. Many of those bases which we built to link America with the world are going to be needed for all time, if we are to keep world skyways open for American planes.

No one can tour them, as I did recently, without coming back convinced that their cost to us in blood and dollars was justified, and hopeful that we shall keep our title to them clear.

The real problem today is that our title to many of them has been indeterminate, for one reason or other, and required involved clearance negotiations all over the map.

When Britain, in the day of her dominant sea power, needed bases to protect her empire lifeline, she got them without too much argument. We ourselves, in the day of air power, face a similar problem of getting permanent bases against a wholly different world background.

Not long ago, some nations were loath to see America remain in permanent possession of bases on their soil. This reluctance is now disappearing, in the face of evidence that the world is going to stay unsettled for a long time. Many countries are beginning to regard our airbases as a bulwark of their own security and their peace.

In general, the problem of post-war bases for our air power on foreign soil falls into two categories—(1) getting commercial rights where we already have long term military rights, and (2) getting both rights where we are still assured of neither.

Early arrangements made with Britain for the use of Atlantic bases, for instance, gave us a 99-year lease for military purposes, but did not cover the commercial airline problem. In the Pacific, on the other hand, we have plenty of territory taken over from the Japs that should be available for military and commercial air bases. But we, ourselves, have clouded our title to our new Pacific bases by our Atlantic Charter assurance that war victors sought no territory or special rights — "no aggrandizement, territorial or other."

Our negotiations with Britain over the commercial use of needed bases have been conducted effectively and well. Britain has doubtless wished to give us what we need.

But as a shrewd trader, she only wants to make sure that America's foreign airlines will not get undue advantage over Britain in the competition for world trade.

Our newspapers ran stories for weeks, for instance, about British reluctance to give American airlines all the rights they wanted for entrance into Britain's home isles. Such news only reflected maneuvers in an international horse trade. Britain wants our airlines to keep their passenger fares high enough to assure profitable operation to Britain's own airlines. That is, she wants no undue price-cutting. She also wants to avoid facing excess competition in airline service. In addition, she would like to get some aviation rights over American territory—such as rights to land at Hawaii and Guam, and perhaps a route over Alaska to Japan. With these goals in mind, she has naturally used to the best possible trading advantage whatever commercial privileges she has available to offer us.

WE have asked for such privileges, for instance, at fields in Newfoundland and Bermuda, and also at Coolidge Field, Antigua, Benae Field, Santa Lucia, and Atkinson Field, British Guiana.

Kindley Field at Bermuda is an example of the bases we have been using for military purposes, and now want for commercial operations. We built it in huge Fort Bell, as a result of our destroyer deal. It is ours for military use for the next ninety odd years. But the needs of our great peacetime airliners weren't allowed for in the original arrangements.

The Air Transport Command built at this base one of its best hotels "De Ginks" in the world. It stands on a hillock overlooking the ocean. Centered around a charming patio with fountain, it measures up to our best Miami Beach standards. Wartime prices were extremely reasonable. They could well continue so for commercial airline passengers.

Below: **A view of the runways, nose hangars and barracks at the airfield we built in Bermuda.**

Just as Newfoundland is the gate to the North Atlantic crossing to Britain, Bermuda is a gate to the route that leads over the South Atlantic and the Azores to North Africa and Iran, and thence over Indo-Burma to China. That is why our airliners will need Bermuda—not to ferry week-end tourists there, but to use as a way station on global routes.

Representatives of Britain and the United States met in Bermuda for long talks over the problem of bases in January of 1946. The talk was not confined to the subject of Bermuda; it concerned various other bases we need for commercial operations in many parts of the empire. Interlocked problems included traffic rights to be accorded the airlines of the United Kingdom, the United States and various other countries, along with the question of getting agreement from various Colonial Governments.

The general accord reached at this conference was a long step forward in ironing out British-American difficulties. But it is only a beginning in solving our hydra-headed problems.

A plane leaving Bermuda, for instance, to cross the southern Atlantic *via* the Azores, will also need rights at other bases located in Portuguese or French territory.

With the ranges of our transports becoming longer, the Azores could be eliminated as a stop in all but bad weather. It is nevertheless a base we should find extremely convenient. We have an excellent military airfield there, on one of the many islands. Portugal has now agreed to extending our use of our base at Santa Maria. Doubtless the British, who have a 500-year old treaty with Portugal on the Azores, used helpful influence in the matter.

We have made a large investment here, in both field and facilities. The Azores Hotel De Gink offers one of the most magnificent views along the route. The dining room is mostly walled in with glass that enables you to see in one sweep the hills ranging into mountains, the green valley with checkerboards of white fences, and the ocean.

On beyond the Azores lies Casablanca, French outpost of North Africa, and largest city in Morocco. From the Azores it is only a morning's hop. Largely built since 1907, modern Casablanca is full of luxurious hotels and villas that offered swank and comfortable quarters even in wartime to the Churchill-Roosevelt-DeGaulle conference, and will do a rushing business when civilian traffic expands.

Here is the great Cazes Airfield, which was long the busiest airdrome in all Africa. Here our ATC trans-Atlantic air routes, and the routes from England and from other parts of Central Africa, made their junction with planes coming in from India and the East.

This busy airdrome also served as the funnel for thousands upon thousands of our soldiers being redeployed when the war in Europe was finished.

It is the French with whom we negotiated for post-war rights at this base. The same thing applies to our old base at Tunis, further up the line in Algeria. The French, on the other hand, had ideas of their own on restoring their pre-war empire. Perhaps successful conclusion of negotiations with the British helped us make workable arrangements with the French. At any rate, shortly afterward, an agreement with the French was also concluded.

ON beyond, halfway between Cairo and Casablanca, lies Tripoli, where we have another costly base in question. Here, in this boneyard of Italian Fascism, the United States Government built an American airbase on 1,299 acres. In construction it is the last word in engineering.

But Tripoli today is a kind of international no-man's land. The British occupy the city, and have a base of their own on the other side of town. We have the splendid airfield, with engineering that offers every evidence of being built on a permanent basis. Russia, meanwhile, has intimated that she, too, should receive privileges in the African Empire of the vanquished Duce.

Russia apparently wishes to fulfill old Czarist ambitions, and establish Russian influence along the Mediterranean, while Britain tries doggedly to maintain her dom-

This is our Cazes Field at Casablanca, Morocco. The 6,000-ft. runway is asphalt surfaced.

inance in the area—one she regards as the jugular vein of her empire. Until the peace treaties are written, our ultimate rights at Tripoli may be in question.

The Allied occupation has made many improvements here. A tremendous horticultural project is in progress, aided by irrigation, to make a garden out of the desert sands. Hard by our airfield is a fine beach where bath houses were constructed for the G.I. clientele, and every beauty of a fine resort was created. Eventually many tourists will be coming to this historic spot, which Mussolini developed as his dream city, the jewel in his North African empire. Americans would seem justified in hoping that arrangements will be worked out to let us keep the base on which we have spent so much.

At Cairo, next stop on the way east, is Payne Field, the largest airdrome in the Middle East. During the war it was a great hub of Air Transport Command operations, with a new arrival or departure every fifth minute. Just as the Suez Canal is the funnel for sea-borne traffic, so Payne Field was the funnel for all air-borne traffic between the theaters of Europe, Asia and the Far East.

Payne Field cost us millions to build and maintain. But it seems destined to revert to the Egyptian Government. We apparently operated this huge stepping stone to the East without any clear cut claim to the land it rests on. Americans have been well liked in Cairo, from the G.I. fresh from the States to the bored airman sitting on Shepheards' famous terrace. And King Farouk I is enthusiastic about the Americans. But that sort of entente establishes no title to real estate.

Similarly, the next important way-station on the way to the East, our field at Abadan, on the head of the Persian Gulf, is another military base to which we have no post-war claim.

Here in the blistering heat Americans fought a kind of war that seldom made any headlines, but tried the soul. At Abadan, under mean annual temperatures of 126 degrees—and with maximums of more than 160° sometimes recorded — most of the American fighter planes and bombers destined for Russia were assembled and checked. Because the planes got too hot to touch during the day, most of the work had to be done at night. Only air-conditioned barracks made the heat bearable for sleeping.

The Allies agreed at Potsdam to evacuate this Iranian base promptly after the war, and we ourselves have lived up to that promise. But this may not have ended the matter, so far as Abadan's foreign occupation is concerned. The oil refineries there help explain why.

Russia, aware that a first class power needs oil resources, seems to regard much of this area as lying in her own new sphere.

The British base at Bahrein Island, used by the British Overseas Airways, was barred to us after 1944. In late 1944 we therefore obtained rights from King Ibn Saud of Saudi Arabia to build at Dhahran an American field which would ultimately become Arab property, but would meanwhile remain for three years under U. S. Army jurisdiction, for use by our planes, military and commercial. Here we are spending some $4,000,000, for facilities that may ultimately be very useful. For the present, this base at Dhahran, which is also an operation center for the Arabian American Oil Co., seems our one sure airfield in this part of the Near East.

ON beyond Abadan lies Karachi, in India —the aerial portal to that great land on its west.

Here we spent millions of dollars on a tremendous circular white stone terminal, with a hotel on the second floor and a chain of offices downstairs. Runways second to none in the world lie on the huge airbase. But this is British territory. From here until one gets to China, he is travelling wholly in an age-old British zone of influence.

Our ATC air routes once tied India together like the framework of a kite, and the British were well served by this operation, which kept Japan at bay while they flung their own Air Forces at Germany. We built huge air depots, so well equipped they could build a plane from scratch, if necessary, and put them in strategic locations like Bangalore, Agra, Calcutta and in the Assam Valley. We conducted, over thousands of square miles, one of the most extraordinary air transport operations the world has seen.

But we established these bases all over India, Burma and Ceylon only on a guest basis. Today we are withdrawing from this part of the Far East. The operations of our Air Transport Command there are virtually ended. By July 1 of this year, the ATC fleet will be cut from 3,000 transports to perhaps 650; schedule routes will drop from 180,000 miles to around 79,000. ATC will continue operations across the Pacific; it has planned to continue limited trans-Atlantic operations *via* Paris through Rome, Athens and Cairo. Whether we shall want future rights in India, and for what purpose and on what kind of arrangement, is a problem apparently not yet resolved.

Our base at Oran, Algeria, in North Africa, is a magnificent installation, not second to Cazes.

Our airfield at Kunming, China, is three miles southeast of the city, near Tien Ch'ih Lake.

On beyond India, in China, is another great series of American-built bases. Our huge airfields at Kunming, Chengtu, Sian (the China stop in the old Berlin-Tokyo run) and Kweilin are only samples of our construction work in this vast country.

We poured in money, trucks, ammunition, planes, fuel, and a myriad of other wartime aids without stint. From these bases, at least, we should hope for some future economic return. For the Chinese undoubtedly offer a big market. And hereafter that market will not be open to Japan. Future Russian policy and the great Communist segment in China do suggest questions that only time can answer. But we may rightly regard China as an important opportunity for American enterprise.

Even if our line of bases through the Middle East does not hold, we have Pacific bases that lead into China from the other direction.

But some of the most important of these Pacific bases raise diplomatic issues of the highest order. Can we consistently retain sovereignty to islands captured from Japan, for instance, in view of our previous declarations favoring UNO trusteeships for all such territory?

The Army, Navy and Joint Chiefs of Staff are said to agree that the Marianas, together with the Caroline, Marshall, and Palau island groups, should be held under U. S. Sovereignty. They are reported willing to see other islands, like Okinawa and Iwo Jima, placed under UNO trusteeships which the United States would administer.

Since Russia apparently intends to hold the Kurile Islands, which she took over from Japan after V-J Day, in accord with the Yalta agreement, many Americans believe we are entirely justified in holding on permanently to whatever Pacific islands we need for our security.

Others seem to think us duty-bound to submit all these islands to UNO trusteeships, on some sort of terms that would insure and perpetuate our own occupancy.

This all adds up to another problem yet to be worked out.

IT will doubtless be Army and Navy policy to make our military air bases in the Atlantic and Pacific available for commercial use, whenever this does not nullify their value as military outposts.

If our people wholeheartedly back our government in its sometimes difficult negotiations with other powers for airbase rights, we shall avoid incalculable loss.

Our commercial airlines, as they extend their operations, will presumably use the military bases under some arrangement that calls for paying proper rents.

The Civil Aeronautics Authority has estimated that 200 American airlines will be operating over 170,000 miles of world airways within two years — compared to 44,000 before the war. It plans shortly to have 16 CAA foreign offices.

Previously it has had only three—at Rio de Janeiro, Lima, and the Panama Canal Zone. Offices at San Juan, Stockholm and Lisbon have now been added, and before 1946 is out other offices are scheduled to be opened in Cairo, Karachi, Manila, Hawaii, Paris, Buenos Aires, Natal, Tokyo, Santiago and Noumea in New Caledonia.

These offices will have the chief function of implementing safety measures in the foreign operations of American airlines. It has been recommended that carefully selected CAA personnel be stationed in each of the countries through which our airlines pass, and that this staff be furnished with all assistance necessary to maintain the prestige of United States aviation in these countries.

Reconversion of the Army Air Forces Weather Service to a peace basis that will protect travellers on commercial airlines has also been under way for some time. On V-J Day it had 534 observation stations outside the United States; these are to be reduced to some 125. The stations in foreign countries which are to be preserved are being turned over to the nations in which the stations are located, for continued operation.

Nearly 200 air navigation facilities installed in 68 countries by our military forces will be kept in operation for the benefit of U. S. international air commerce, under an order from the President issued in April to give the Department of Commerce this authority.

The War and Navy Departments have been operating, at points outside the United States, approximately 600 radio ranges, airways communication stations and similar facilities essential to safe air navigation. A sub-committee of the Air Coordinating Committee of the Federal Government has found that 258 of these installations are necessary to international air service, and that 66 will be continued by military agencies in connection with occupation or similar duties.

The United States Department of Commerce is now empowered to make arrangements for continued operations of the remaining 192.

Thus the outlines of our post-war airline traffic on global routes are slowly taking form.

John Payne Field, just northeast of Cairo, Egypt, was built literally out of the desert sands.

Above you see Canfield Cook in a "Voyager 150". Mr. Cook used the Stinson in making the film for his 1946 lectures.

Speaking of Airplanes

By Canfield Cook

Mr. Cook, who flew with the RAF as a bombardier pilot in World War I, and has written seven books on aviation, has been lecturing to American audiences on air power for over a decade. In his current national lecture tour he is showing a film that features a Stinson Voyager 150, to illustrate the ease and safety of touring by personal plane. He is a member of the Institute of Aeronautical Science; his audiences total thousands of Americans annually.

I'VE learned that the average citizen today takes it pretty much for granted that one day he will fly by scheduled airliner where in the past he has used other modes of transportation. But his feelings with regard to owning and flying a personal aircraft are —to say the least of it—mixed.

The people who rise in my audiences to ask questions show—by these very questions —that, having never flown a plane, they wonder if they ever could dare.

Aside from worrying about costs, the average citizen finds it difficult to picture himself at the controls of his own aircraft—unless it be a helicopter. Strangely enough, a peculiar and unique affinity has developed for the helicopter idea. But the average man is far from being convinced that flying an airplane is as simple as driving an automobile.

With another dimension involved, he feels there must be additional complications. And because he is not accustomed to these complications they become hazards in his mind. He is ready and willing and even anxious to speed up his comings and goings above surface traffic. He is well aware of the business and recreational advantages. But the airplane catapults him into a dimension where he feels a strange explorer.

This, I think, is the hub of the problem of getting our nation on wings. I'm inclined to think the difficulty—an emotional difficulty—should not be approached by argument. You cannot argue with emotion. One of the simplest approaches is to get a man into a Stinson, and let him learn by his own experiences what real freedom of transport means.

In the past decade I have been called upon to answer many thousands of questions from the platform. It is the part of my lecture programs I enjoy most and from which, I am convinced, my audiences derive the greatest amount of satisfaction. And I have discovered, over the years, that audience questions are a good index to national thinking on aviation problems.

One indication of the increased interest in matters aeronautical is the fact that audiences nowadays are usually of capacity size. There is a growing and avid appetite that will not be stayed even by late hours and prior commitments. In many instances the open forum period often threatens to exceed the length of the regular program, if not brought to a summary close.

ESPECIALLY significant is the change in the character of questions over the last decade. Ten years ago, when the idea of flight was remote and generally regarded as a means of transportation in which only other people indulged, questions were apt to dwell on flight theory. Of this type of query the one I remember best was put to me by a very serious ten year old. After viewing a succession of flight scenes on the screen, he cut down to the root of things by inquiring in a shrill, piping voice, "What kept them up there?"

Today the infrequent flight theory question is put so hesitantly that it is evident the questioner feels himself out of step with the times.

In the immediate pre-war years, audience interest began to focus on the state of our air power. When I was lecturing with the film "Sky Defenders," which I had produced in cooperation with the Army Air Corps in 1940, questions revolved around the comparative merits of our warplanes and those of other nations — Germany in particular. Strangely enough, some of our civilians seemed more alert than some of the military. On one occasion, when I told a large west coast audience that, in view of the speed of aircraft development, our Hawaiian installations might well become the target for Jap attack, I was soundly berated by one high-ranking officer for "alarming the public unnecessarily."

But public alertness grew. In 1941, at the invitation of the Canadian Government, I produced two official films for the use of the Canadian air forces—one showing flight training activities north of the border, and a sequel picturing the combat experiences of pilots, navigators, gunners and bombardiers. I combined these for presentation to American audiences in a program called "Air Power Can Beat Hitler"; the response they brought amazed me. Questions were focused almost entirely on possible air attacks and the means of combatting them.

Today American audiences take our military air power for granted; they wait to know what aircraft can do for the civilian. Even before the end of the war, questions began to focus on application of wartime aviation developments to peacetime flight.

How wartime flight experience can be one of the most important factors in the postwar purchase of a personal aircraft was indicated by a lecture incident of almost five years ago, and its recent sequel.

"The 'Voyager 150' is a grand plane," he says.

At an informal "after meeting" talk, one man in my audience—a business executive—said he was planning to purchase an airplane to speed up his calls on widely scattered branch offices. Another executive, in an almost identical business position, challenged the whole idea, calling it impracticable because of weather delays and inaccessibility of airports. At a second meeting held recently with this same group, I found that the previous enthusiast had never gone through with his plan, on account of the war. But I learned, with surprise, that the previous scoffer had now ordered an airplane for the very purpose he had vehemently decried. It seemed that his son, who would shortly be back in civilian life from the air force, would do his piloting—at least until Dad caught on.

CURRENTLY, one of the most frequently asked queries is, "Will the airplane someday supplant the automobile?" The questioner has more than a roadable airplane in mind when he puts it. In few cases does he either wish or intend to give up his familiar automobile of transport. What he is actually trying to learn, in this seemingly roundabout manner, is the comparative cost of aircraft ownership as against automobile ownership.

There is a deep interest being shown by audiences in all of the facts regarding costs and aircraft utility. Many a potential buyer of a light aircraft at this time is apt to exaggerate ownership costs, and so to discount utility. So great is this interest that (in the opinion of the writer) advertising which factually explains these factors will have the highest value and response.

Meanwhile, for the scores who dream of owning a personal plane, there are thousands who intend to fly by airliner. Audiences now realize fully that the speed of air travel can make the world their oyster within the limits of a two week vacation. This hardly means, of course, a whole nation on wings. Many citizens seem more inclined to think of vacations in terms of rest and recreation than of global marathoning by air; if and when they fly, it will be to reach a pleasant resort quickly, and stay there. Further, it will be the exception who can afford global marathoning, even on the basis of the most optimistic air tariff proposals.

But global air transport does open up vast and hitherto untapped travel fields for all the time-poor travelers who — by that very token—can afford extensive air travel whenever they can "get away".

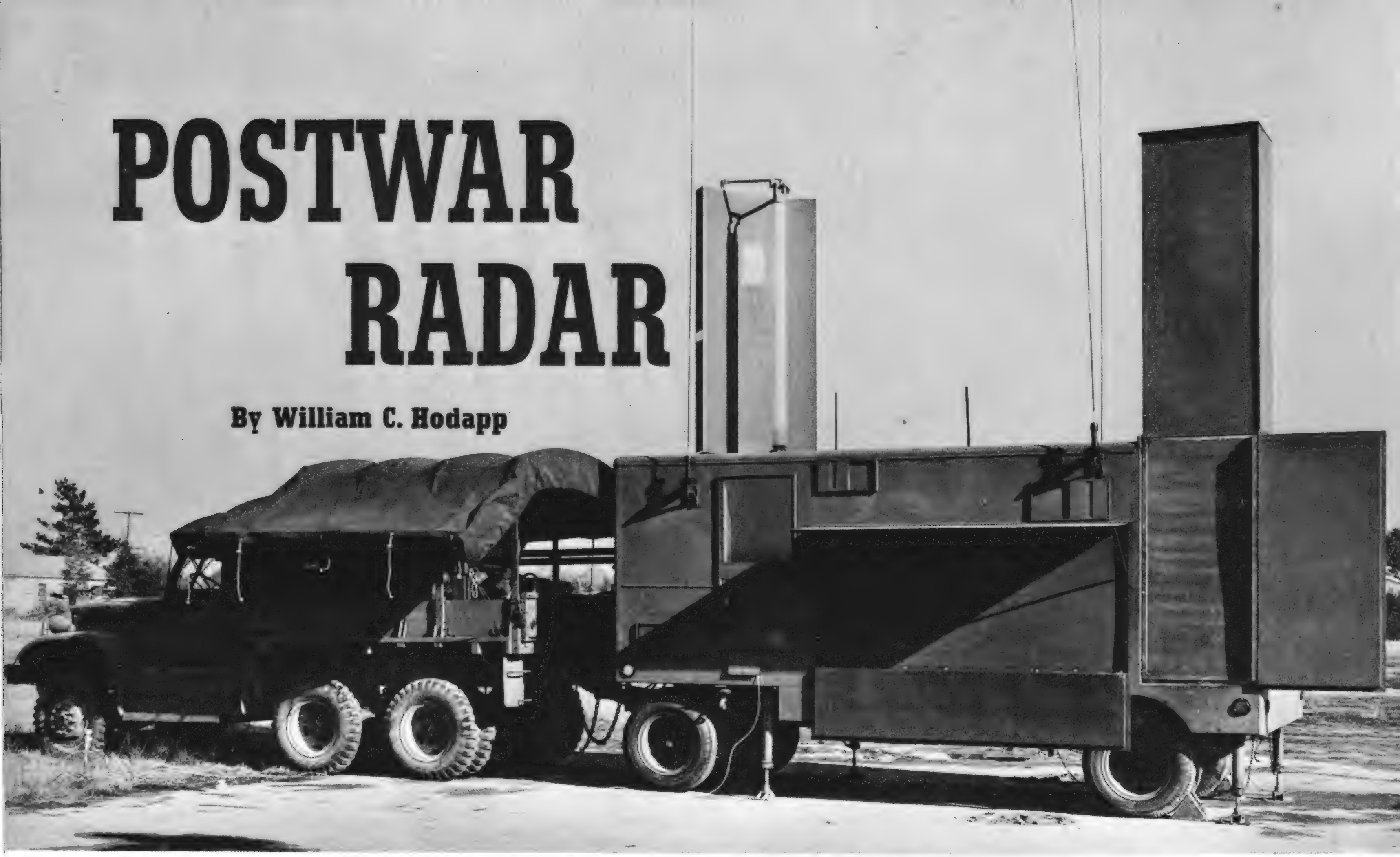
Another large group can also perhaps be counted on for global travel — our school teachers. They have been our most ardent foreign travelers in the past because their summer vacations made them time rich; now some of them are going to increase their radius of exploration. Two months of vacation hardly sufficed for more than the average leisurely European study tour of the past. Now those who have "done" Europe are casting their eyes to South America, South Africa, Australia and the Orient. They show by their queries that they have air transportation in mind as they plan.

The public seems to show small confidence in the theory that mankind can be linked into brotherhood through the untrammeled reaches of the sky. But people do evidence belief that expanded air communications can at least engender a better understanding by us of the rest of the world, and perhaps of us by other nations.

And I find them saying that we must henceforth maintain our status as the greatest air power in the world—the status with which we emerged from the war. They are also eager for a fast expanding program for airports and other air terminal facilities. They show a sober knowledge that only air-minded community initiative can make aviation useful to every citizen. American thinking, as usual, is way out in front.

POSTWAR RADAR

By William C. Hodapp



This is the device called GCA—Ground Control Approach—as the Army Air Forces used it. GCA will soon be installed at many commercial airports.

The author writes with the authoritative background of a Major in the Army Air Forces, but his views do not necessarily reflect those of the Air Forces and the War Department.

SOME confusion has been voiced over radar's relation to television. The truth is that in major principles they are not alike, and were wholly separate developments. There has been virtually no contribution from one to the other.

But in just one point there is similarity: Radar, like television, promises much, yet raises a real question as to how quickly it will have an impact on our peacetime routines.

Certainly, its full adaptation to commercial and personal flying is not to be immediate. But there are signs that in the next five years the significance of radar for peacetime flying will be clearly demonstrated, both in application to postwar commercial transport flying and to piloting private planes.

Several major airlines asked last year to borrow airborne radar sets from the AAF, for use in familiarizing their chief flight personnel with radar's capabilities for making air travel safer. Until private industry can manufacture these sets in quantity, the AAF has been assisting the airlines by the loan of this equipment.

Unfortunately, there were not enough radar sets to be declared surplus. So they will not be available from the Army in the interim except through loans.

As most people now understand, radar's chief usefulness is to give the pilot "sight" when he is flying under "instrument conditions"—that is, when cloud, fog or weather hide the country below or obstacles ahead, such as mountains, buildings, other aircraft. The radar waves, bouncing back from the obstacle in their path, give the sender a kind of "echo" which can be interpreted to characterize the obstacle: this echo may be translated into either aural signals, or visual signals that form a picture on a radarscope.

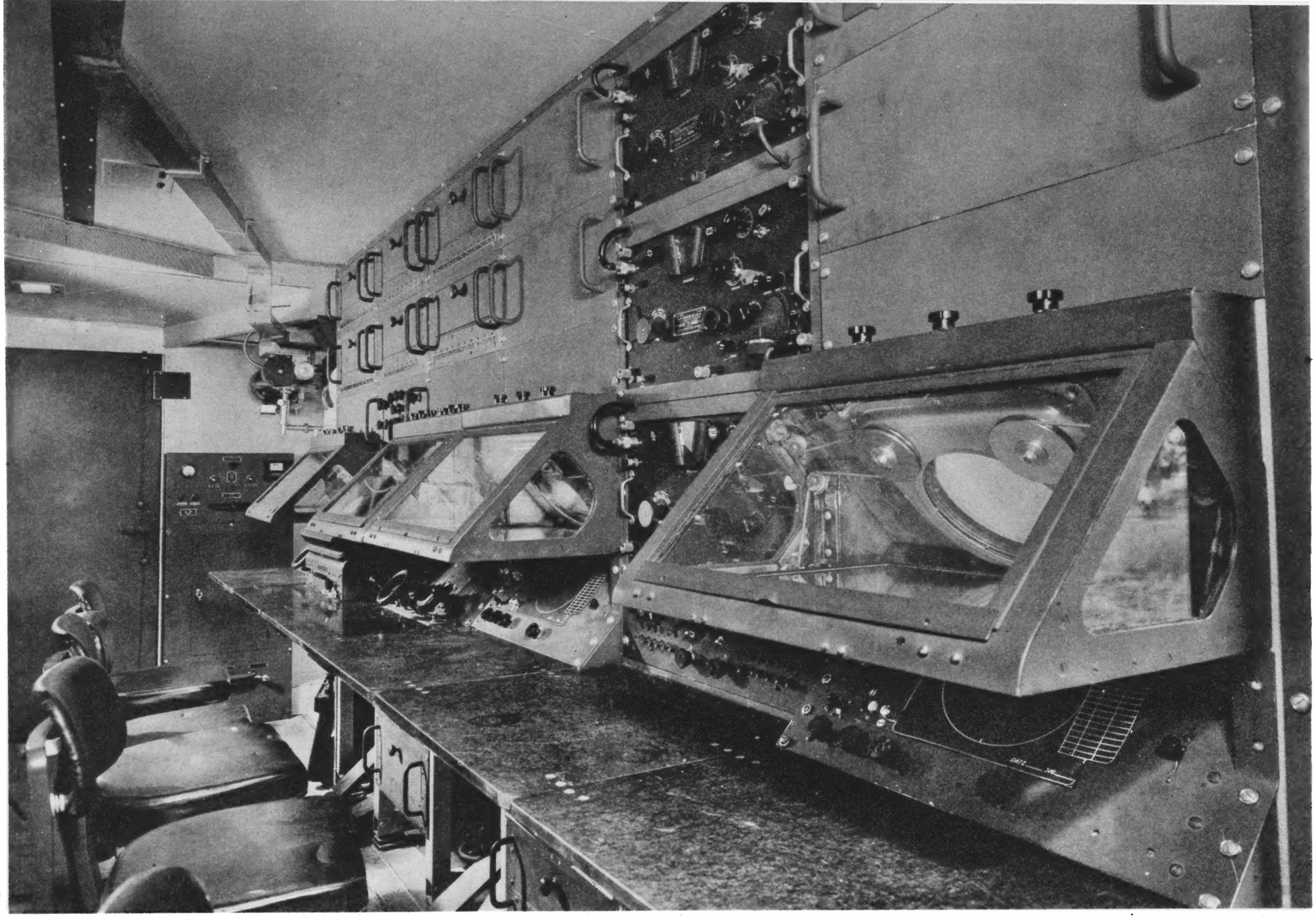
The usefulness of the airborne radar set in promoting safe flying can be demonstrated by citing its performance in the case of severe thunderstorms. When flying into a "front", it is very difficult for a pilot to distinguish, in the heavy cloud formations, the ominous rounded whorls within the front which are known as thunderheads. These are most dangerous to fly through, since they contain the dynamic energy of thunder and lightning.

But radar "sees", through the mist of weather fronts, these pressure elements, which resemble exaggerated puffs of smoke from a cannon, yellow-gray in color. Radar thus charts a safe course through the clouds, enabling the pilot to avoid the severe stresses and strains of turbulent air, and completely overcoming any possible risk.

All-weather flying is of course an important goal in today's aviation. Estimates of the daily loss when a transport plane must cancel its flight range from $1900 to $9000 a day. In one week alone at New York's La Guardia Field, 547 flights had to be cancelled because of weather factors.

But it should be re-emphasized that the day when all planes are radar-equipped is still some distance away. And all-weather flying is also not going to be commercially practical for some time. Theoretically, the all-weather airline is now possible. Authorities say the Army Air Forces have enough navigational aids on hand to inaugurate such a line immediately. But such a project must for awhile be regarded as wholly experimental.

AT AN All-Weather flying conference held in Washington this last February, Air



This is the radar instrument panel that is used in installations on the ground. An inexpensive installation for planes is a pressing problem.

Force speakers seemed agreed that various obstacles must still be overcome. In the words of Major General Curtis E. LeMay, Deputy Chief of Staff for Air, the "gadgets" exist to make all-weather flying possible; but "no one is going to do it to any great extent" until they have further development and application. And Colonel Joseph De Lee, Chief of Staff for operations of the Air Transport Command, declared that radar is still in no sense a substitute for a pilot's eyesight:

"The most important cog in any all-weather flying-control plan is the method whereby the pilot can establish visual contact with the ground just prior to his landing in almost zero-flying weather. Regardless of technical developments in blind-landing control, the human element is all-important in that instant before the pilot touches his plane to the ground."

This same conclusion was emphasized at the January conference of the Society of Automotive Engineers, held in Detroit. Said E. A. Cutrell of American Airlines, in a paper read by Robert Ayer, Chief of Engineer Operations:

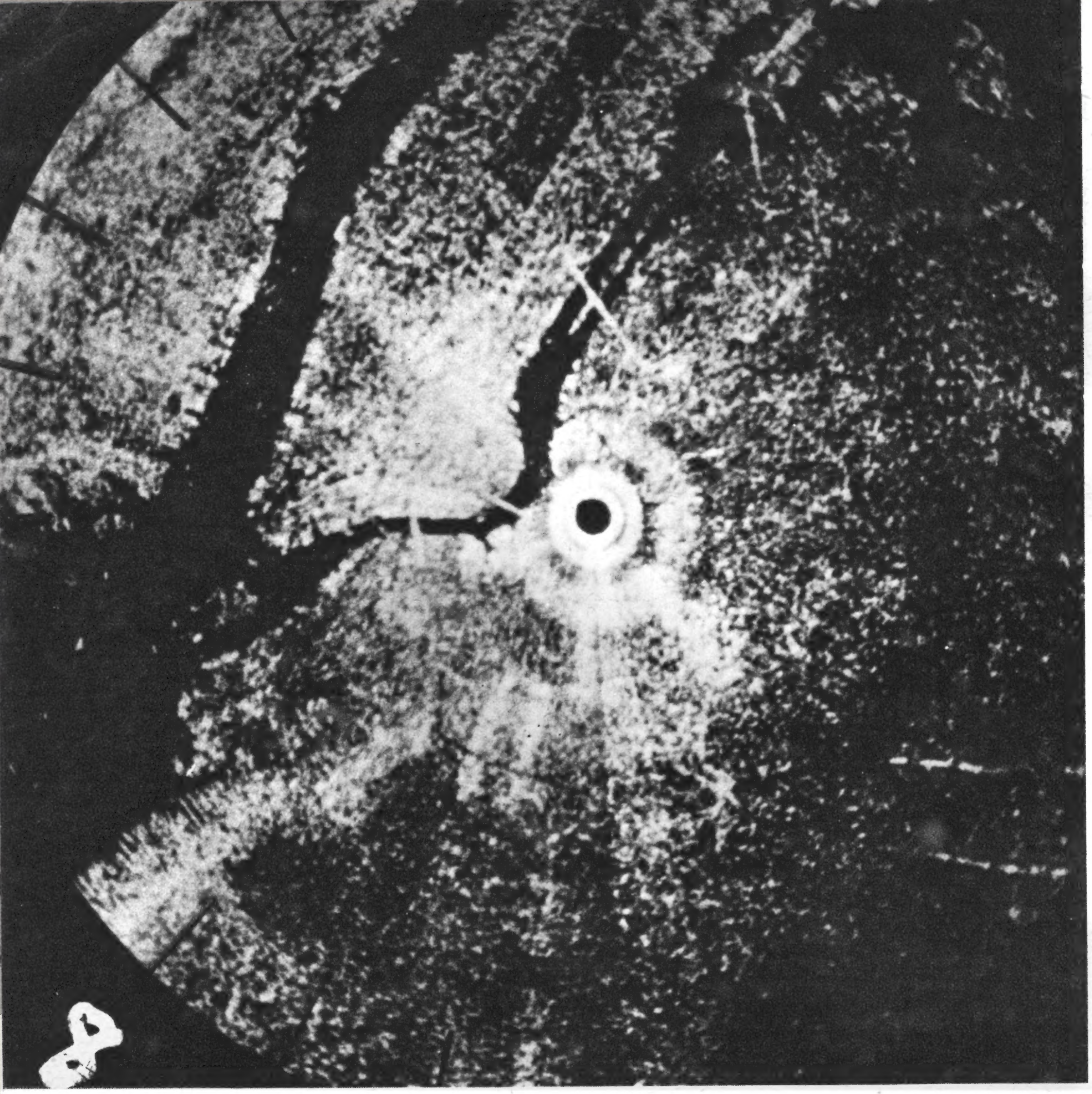
"Those who believe we are about to launch into an air age where airliners will land automatically by radio, radar or electronics are wishfully thinking. This generation of airline pilots will make their landings visually. Better runway and approach lights are more important for immediate consideration than radio landing systems — because the Civil Aeronautics Administration's program for radio installation is now far ahead of airport lighting improvements. Only two airports in the country have runway lights considered adequate for all-weather landings; these are at Indianapolis and Newark."

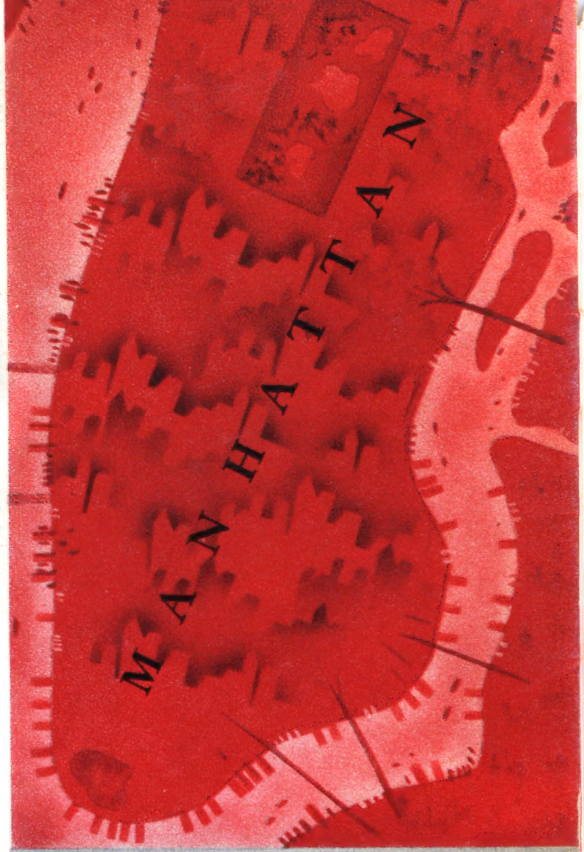
Thus, while technical groups like the CAA, and commercial organizations like the Air Transport Association, study the adaptation of radar to civilian flying, other safety improvements will doubtless come first. Very High Frequency radio aids — other than radar — rank foremost among these. The CAA authorities say that various important V.H.F. installations will be available in two years even to pilots of personal planes. And eventually the whole airway range system of the country is to be converted to V.H.F. When the planes have the installations, the ground installations for the communication systems will be in operation.

The V.H.F. radio band is above the usual static band in radio, and this largely eliminates the danger of failure in communications at crucial times. Instrument landing equipment using V.H.F. impulses is being installed by the CAA at nearly 100 airports throughout the country. The three-element V.H.F. system now recommended by the CAA consists of the "localizer", "glide path", and "marker beacon".

To make distinctions clear to the average reader, it should perhaps be explained that Radar employs Very High Frequency waves, just as does the V.H.F. instrument-landing equipment used in the system cited above. For the layman, the simplest distinction between radar and other V.H.F. installations may be this: Radar sends a V.H.F. impulse and receives an echo, and so may be thought of as "one way communication"—while other V.H.F. systems employ the long familiar principle of receiving radio communications from a sender.

Such developments indicate that various other technical advances will be given wide practical application in aeronautics, before radar is in general use. Probably radar's first peacetime job will be at airports. The CAA





At left, you see New York City as it shows up on a radar screen. Clearly marked is the lower half of Manhattan, surrounded by two rivers. Central Park shows as the darkish oblong.

has been working at its Indianapolis experimental station with radar sets received from the Army, to adapt them for viewing screens that can be installed in control towers. Such viewing screens will enable control tower operators to "see" incoming planes even in bad weather, and bring them in for faster, safer landings.

HIGH official sources in the AAF predict that the use of radar for civil traffic control at airports, during instrument conditions, may be a reality this year — particularly in congested areas of the United States.

The GCA, or Ground Control Approach, is already in operation on many Army airfields. There are not enough of the instruments to be available to commercial airports through Army surplus; but they have been made available for study and investigatory purposes.

Before private planes can be equipped with radar, costs must be brought down a long way. At the present reading of the situation, the cost of radar equipment is prohibitive — $8,000 a set being the cheapest now possible to produce. This is humorously referred to as the "poor man's" device.

Radar will ultimately be mandatory, in some form, for civil transport. At present the problem of adapting radar to commercial aviation seems as much a problem of equipment weight as of cost. Just now, in its lightest form, airborne radar equipment weighs around 150 pounds—the equivalent of one adult passenger. But the weight, too, should be brought down, to perhaps half of this.

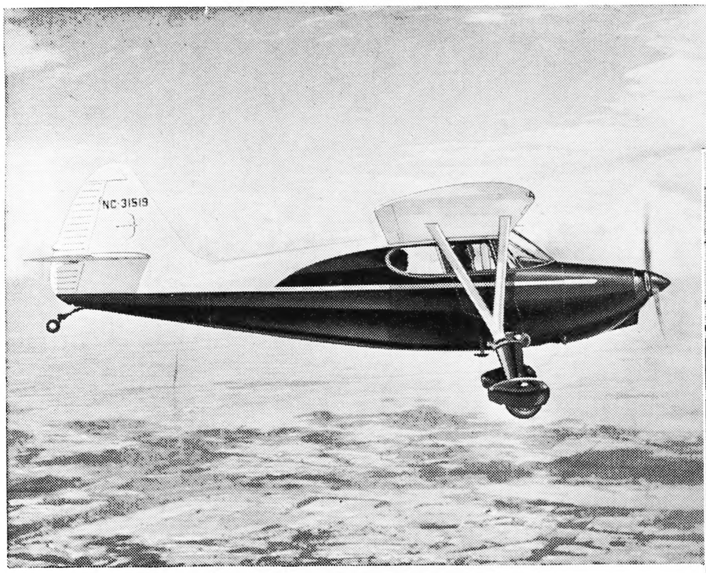
If radio communications between ground and air fail, the radar equipment can still continue to function, and the pilot may find a safe landing place and come in—always keeping obstacles well in mind, since they are there before his eyes. Complete failure of all communications, according to the Army Air Forces, is extremely rare nowadays; and will be even rarer when V.H. Frequencies are generally used. But no system of operation can be wholly beyond emergencies.

Is it possible to distinguish definite objects and identify them through radar? Yes. Land and water definitions are extremely clear. With practice and experience, a pilot or operator can learn to interpret the echoes from many different kinds of objects, and tell exactly what they are.

Radar, as already noted, is extremely valuable in weather forecasting—enabling the pilot to see in advance what kind of weather is headed in his direction, or he is headed toward. Not only can fronts be located, and the location of thunderheads; it is also sometimes possible to tell what kind of storm is approaching — whether hurricane, typhoon or whatever.

Because the airplane of tomorrow will be too big and too fast to tolerate the extreme turbulence encountered in frontal activity, future pilots will find radar a most important addition to the safety devices that already make commercial flying safer than even some of the early optimists dared to forecast. One of the few remaining weather hazards a pilot may meet in flight is the sudden local thunderstorm, that could not be forecast by the weather services.

If safety is to be a prime consideration in flight—and of course it is for our whole aviation industry — radar will ultimately take the remaining small "if" out of it.



When you put your Stinson Voyager 150 into a climb, you can sit back and relax . . . confident that it will take you over the mountains ahead. With this plane, you don't have to waste time and fuel in spiraling to gain altitude. The Voyager 150 climbs at the rate of 770 feet per minute, has a service ceiling of 14,000 feet.

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